Auditory Hallucinations: an Investigation of Associated Trauma, Dissociative and Schizotypal Factors

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Thank you.

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Chapter 1: Introduction

1.1. Overview of Study

The phenomenon of hallucinations has been viewed as a key symptom of psychotic illness, which arises from biological disturbances in the brain (Schneider, 1959). Recent research has provided evidence to suggest that hallucinations do not necessarily distinguish individuals with a psychotic illness from those that do not, and that they are not necessarily pathological in nature (Janssen *et al.,* 2004; Johns & Van Os, 2001). Although progress in psychological research has advanced our current understanding of psychosis, it has also introduced new questions about the factors associated with its development. Consequently, it has been highlighted that further psychological research is required to investigate the phenomenon of hallucinations and contribute to models for understanding their occurrence (Kilcommons & Morrison, 2005; Krabbendam *et al.,* 2004; Morrison & Peterson, 2003; Perona-Garcelan *et al.,* 2008).

This thesis presents an overview of historical conceptualisations of psychosis, followed by a detailed discussion of key psychological models of psychosis and an evaluation of recent literature on psychological factors associated with hallucinations. Driven by gaps within the existing literature base, the present study uses quantitative research methodology to explore the association between auditory hallucinations and events such as trauma, and processes such as dissociation, and schizotypy. The results of the study are described and clinical implications discussed in the context of existing evidence. It is intended that the quantification of key factors associated with auditory hallucinations will contribute to our current understanding of these factors in the development of auditory hallucinations (particularly in the context of other psychotic symptoms) and to their effective assessment and treatment within clinical settings. Equally, it is intended that a clearer understanding may also contribute to the identification of those 'at risk' of developing symptoms of psychosis and therefore prevent the development of normal psychotic-like experiences to symptoms of psychosis.

1.2. Overview of Psychosis

1.2.1. History, Diagnosis & Epidemiology of Schizophrenia

Within western cultures, disturbances of the mind have historically been divided into two categories: neuroses and psychoses. The term neurosis was first used in the 18th Century to

describe disorders of the nervous system that caused mild mental imbalance with intact insight, in the absence of organic aetiology (Coleman, 2003). On the other hand, the term psychosis was used to describe disorders of the mind that compromised a person's rational thought and sense of reality, akin to insanity or madness (Coleman, 2003). Typically, a gender bias has been reported between the two categories, with more males reporting symptoms of psychoses, and more females reporting symptoms of neuroses (Kessler *et al.*, 1994). However, with greater knowledge and understanding, these rudimentary distinctions of mental illness have been advanced with a focus more on the individual features of the different disorders, than on their similarities (Gelder *et al.,* 2001).

More recently, the term neurosis has become understood to refer to emotional disorders such as problems with mood and anxiety, whereby an individual's ability to distinguish reality from fantasy remains intact. Conversely, the term psychosis has also been used to refer to a group of psychotic disorders characterised by bizarre thoughts and beliefs, alongside disturbances to personality and impaired insight (Gelder *et al.*, 2001). Unlike emotional disorders, hallucinatory and delusional experiences are hallmark features of psychotic disorders and often occur alongside loss of concentration, apathy, compromised insight and a disturbance to conscious thought. These psychotic experiences can be distressing or disturbing for the individual and within psychiatric models are diagnosed as schizophrenia, schizophreniform disorder, schizoaffective disorder or delusional disorder. Hallucinations in particular, have been reported as the most common feature of schizophrenia (Sartorius *et al.,* 1986) and are often interpreted as indicative of psychosis.

Despite frequent use of the generic term psychosis to describe a range of experiences involving loss of contact from reality, there remains some variation in the language used to refer to elements of these experiences. This variation in part reflects underlying differences in the theoretical models that have evolved to explain these experiences, particularly between medical and non-medical perspectives. From a medical perspective, a constellation of symptoms including hallucinations, delusions, disorganized speech and behaviour, alongside flat affect and a decline in motivation, is likely to be considered as indicative of a psychotic disorder defined as schizophrenia (DSM-IV; APA, 2000). However, from a more psychological perspective, such experiences are likely to be considered as psychotic in nature or described as symptoms of psychosis, but not necessarily assumed to be pathological or indicative of a specific psychiatric disorder such as schizophrenia (Bentall, 2003).

Variation in terminology used to describe a range of experiences characterized by a loss of contact from reality has implications for the definition of the exact constructs assessed and

measured in both research and clinical settings. Equally, it highlights the importance of clear construct definition within the literature. Consequently, the term 'psychosis' will be the preferred term used throughout this thesis to refer to experiences and symptoms of psychosis unrelated to diagnostic constructs, such as hallucinations and delusions. However, more medical terminology will be used when citing from literature in which the experiences of psychosis have been specifically defined as a psychotic disorder, such as schizophrenia, and for defining the inclusion and exclusion criteria for the current study's participant samples.

In terms of epidemiology, the lifetime prevalence of mood disorders in the general population is estimated as 13.9% and 13.6% for the anxiety disorders (ESEMeD Project, 2004), and 0.4% for schizophrenia (Saha *et al.,* 2005). It is possibly due to the lower prevalence and incidence rates of schizophrenia and the associated psychotic disorders, alongside the questionable validity of the construct (Bentall, 2004; Boyle, 2002), that they have typically remained less well understood than the emotional disorders. However, over recent decades this picture has changed, with individual symptoms of schizophrenia, such as hallucinations and delusions increasingly becoming the focus of research rather than the overall disorder (Bentall, 1990).

1.2.2. Hallucinations- a Symptom of Schizophrenia

With hallucinations reported as the most common symptom of schizophrenia and the associated psychotic disorders, hallucinatory phenomena have been recognised as a key feature of psychosis (Sartorius *et al.,* 1989). Hallucinations have been defined as "a perceptual experience similar to a true perception but not resulting from stimulation of a sensory organ" (Coleman, 2003, p.322). These experiences can occur across the sensory modalities (including visual, olfactory, gustatory, tactile and auditory) and are typically reported as seeing visions or smelling odours which others do not (Romme & Escher, 1989).

The experience of hallucinations can be positive, whilst others can find the content and nature of their hallucinations to be distressing and difficult to cope with (Romme & Escher, 1989). For those people who experience hallucinations as distressing, their social functioning can become impaired and their experiences can interfere with their daily life. This is particularly true when hallucinations are accompanied by delusional beliefs that can further compromise an individual's functioning, as reported in 11% of those who experience hallucinations (Johns *et al.,* 2000). However, hallucinations appear to not be solely indicative of 'disorder', as 10-25% of the population have hallucinatory experiences at least once in their lifetime (Slade &

Bentall, 1988). Tien (1991) estimates 5-10% of the general population report such an experience at any one-point in time, whilst Ohayon (2000) estimates hallucinations occur within 39% of the general population. Given these figures of prevalence, despite variance between studies, hallucinations have become increasingly viewed as a part of normal psychological functioning (Morrison, 1998). However, studies of the prevalence of auditory hallucinations in particular appear to be limited, although Tien (1991) found that 2-3% of the general population reported such an experience.

Reported by 70% of people with a diagnosis of schizophrenia, auditory hallucinations have been reported as the most common type of hallucination, and therefore the most common feature of schizophrenia (Ohayon, 2000). However, rates vary considerably across cultures and across the different senses. Thomas *et al.* (2007) for example evaluated cultural differences in factors associated with hallucinations by comparing Indian and US participants with a diagnosis of schizophrenia or schizoaffective disorder. Within the study, hallucinations of different modalities were measured and 64% of the Indian sample reported auditory hallucinations, whilst 83% of the US sample reported auditory hallucinations. Consequently, from studies such as Thomas *et al.*'s (2007) there appears consistent evidence to suggest that auditory hallucinations are the most common type of hallucination reported across cultures, although the prevalence rates seem to be more effected by cultural differences.

Nevertheless, despite the prevalence of hallucinations in the general population and increased prevalence in clinical populations, there exists no one definitive theory to explain such an occurrence of hallucinatory phenomenon. Theological theories have historically conceptualised hallucinations of a religious nature as contact with spirits or divine entities and as a spiritual gift (Polkinghorne, 1998). Philosophical theories of representationalism on the other hand have traditionally understood hallucinations in the context of perception, whereby conscious perceptual experiences are viewed as representations of the world rather than the world itself (McCreery, 2006). Recently however, psychological, sociological and biological theories have also evolved in an attempt to understand such phenomenon.

1.2.3. Psychosis- from a Biological Perspective

Given the often unusual and bizarre nature of hallucinations, a biological approach has principally been used within western society to explain their occurrence in terms of brain or biological pathology. It has been proposed that hallucinations are a product of a functional deficit in the brain and as a key symptom of mental illness. This pathological understanding has been influenced by the work of psychiatrists who focused on the disease nature of mental

illnesses and were driven by differentiating 'sanity' from 'insanity' between the late 19th century and early 20th century (Bentall, 2004).

In his work, Kraepelin (1919) developed a classification system particularly for the 'psychoses' in which hallucinations and delusions were understood as a symptom of a degenerative syndrome called Dementia Praecox. Bleuler (1911) advanced the concept of hallucinations as part of a degenerative disease process and described the associated distortion of perception, thinking, memory and personality as a mental illness called 'schizophrenia'. Schneider (1959) later furthered Bleuler's work on mental illness by describing all forms of hallucinations as 'first rank symptoms' of schizophrenia. Consequently, Schneider and other theorists at the time were influenced predominately by a categorical approach to understanding mental illness, with hallucinations viewed as synonymous with mental disorder.

From such a biological understanding of mental illness, classification systems have developed to support the process of diagnoses, such as the Diagnostic Statistical Manual-IV (DSM-IV; APA, 2000) and the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10; WHO, 1993). Within these diagnostic classification systems 'positive symptoms' of psychosis (which include hallucinations and delusions, disorganised speech and behaviour) are often distinguished from 'negative symptoms' of psychosis (which include apathy, lack of motivation and social withdrawal) to aid classification (Sims, 2002). The categorical nature of psychiatric diagnostic systems has offered scientific and clinical value within the domain of medicine, despite a lack of substantial empirical evidence for the validity of the diagnostic categories, and their biological correlates (Bentall, 2004; Boyle, 2002). Furthermore, the psychiatric model has focused attention towards the presence of hallucinations, rather than on the content and meaning of the experience to the individual, and has led to a conceptualisation of hallucinations as intrinsically pathological in nature.

Genetic theory aims to support the biological perspective of schizophrenia by assuming its biological correlates are associated with genetic factors. Familial studies have been used to identify the prevalence of schizophrenia diagnoses in biological relatives of people diagnosed with schizophrenia (using twin studies and adoption studies) (e.g. Cardno *et al.,* 2002). Whilst the results of these studies have often reported a familial link, however methodological problems and heterogeneity of results has limited generalizability of the findings (Boyle, 2002). Genetic linkage studies have also investigated the role of genetic factors by

researching biochemical markers associated with schizophrenia (Weinberger, 1997). This debate is ongoing, and has as yet yielded no identifiable genetic component (Boyle, 2002). In view of the limited evidence for genetic factors associated with brain abnormalities in schizophrenia, alternative accounts of psychotic experiences, such as those proposed by psychological models, have become increasingly researched and evidenced.

1.2.4. Psychosis- Category or Continuum

It is interesting to note that despite these conceptions of psychosis, a century ago, there was also consideration that symptoms of schizophrenia may rather be an extreme expression of thoughts and behaviours that could be present to varying degrees within the population, rather than a definitive expression of insanity (Bentall, 2004). With the prevalence of psychotic-like experiences in the general population, such as Tien's (1991) estimation of 5-10% reporting psychotic-like experiences at any one-point in time, there is evidence to suggest that symptoms of psychosis may fall on a continuum related to everyday experiences (Myin-Germeys *et al.,* 2003). Accordingly, it is possible that hallucinatory experiences may fall on a continuum of mental imagery related to everyday experiences of daydreaming, with the presentation of hallucinations associated with delusional beliefs at the more severe end of the spectrum (e.g. Bentall, 2003; Johns & Van Os, 2001).

In a review of evidence for a psychosis continuum, Johns & Van Os (2001) describe their dimensional understanding of psychotic experiences as existing on a continuum with normality. Similarly, Myin-Germeys *et al.* (2003) proposed from their review of the literature on psychotic-like experiences in the general population, that these experiences are continuously distributed, with clinical disorder at one end of the distribution. Such a dimensional perspective is supported by evidence that outlines the characteristic age-related variation in the incidence of schizophrenia to parallel a similar age-related expression of delusion and hallucination in the absence of any psychotic disorder (Van Os *et al.,* 2000).

Importantly, this evidence suggests that psychotic symptoms mirror those of everyday experiences, whereby psychotic-like experiences and psychotic disorder are continuous in the general population rather than perceived as a separate disease dichotomy (Janssen *et al.,* 2004). A continuous conceptualisation of hallucinations and delusions suggests that they are variable in degrees of intensity and severity, and not necessarily indicative of psychopathology. In terms of factors that may influence variation in the continuum, Krabbendam *et al.* (2004) suggested from their investigation of dimensions of depression, mania and psychosis in the general population, that psychological and psychosocial factors may be particularly influential. It is also interesting to note that a dimensional perspective of

psychosis supports the idea that psychotic symptoms are comparable with affective disorders like depression (Beck *et al.,* 1979).

1.2.5. Psychosis & the Person- a Psychological Perspective

Despite the pervasive medical model that has influenced conceptions of hallucinations over time, Jaspers (1913), amongst others, has challenged this perspective. Jaspers questioned Kraepelin's model of illness and considered the importance of psychological and social factors (such as personality and environmental stressors) in the development of psychosis. Importantly, he recognised that psychosis often manifested after a preceding life event and, subsequently introduced a biographical approach to psychiatry regarding a patient's illness in the context of his life history (Jaspers, 1913). Since that time a number of key psychological theories have developed in an attempt to provide a more comprehensive account of psychotic experiences. Although there is as yet no single encompassing psychological model of psychosis, which in itself may reflect its complex, diverse and multi-factorial nature, these theories will be considered in greater detail.

1.2.6. Summary of the History, Diagnosis & Epidemiology of Schizophrenia

From the summary of the evidence above it appears that an understanding of the key features of schizophrenia and the associated disorders of psychosis has evolved considerably from categorical models of biological disturbance in the brain to more dimensional models that also account for the role of psychological factors. The prevalence of psychotic-like experiences in the general population (Ohayon, 2000; Tien, 1991) suggests that psychotic symptoms such as hallucinations do not necessarily distinguish individuals with a psychotic illness from those that do not. This has drawn into question the validity of diagnostic categorisation, particularly for schizophrenia and the associated psychotic disorders (Bentall, 2004). Consequently, it seems that hallucinations cannot necessarily be interpreted as synonymous with mental disorder. Rather, hallucinations experienced within the context of delusional beliefs may more accurately be understood as occurring at the severe end of a continuum of psychotic experiences, which occurs in the general population and may vary over time (Janssen *et al.,* 2004; Johns & Van Os, 2001). As such, it is the influence of psychological factors on variation along this continuum that is of particular interest in the current study. To better understand current models of psychosis and to identify gaps within the existing literature base, key psychological theories of psychosis will be reviewed, followed by a discussion of recent evidence for factors associated with hallucinations.

1.3. Psychological Theories of Psychosis

Various psychological theories of psychosis have evolved to understand the development of psychotic experiences. Psychoanalytic, neuropsychological and cognitive theories have all made valuable contributions to our understanding of the possible psychological processes involved in psychosis and the subsequent development of assessment and treatment models. Since there is as yet no single encompassing psychological model of psychosis, the key theories have been summarised below.

1.3.1. Psychoanalytic Theories

From a psychoanalytic perspective, Freud understood psychopathology as arising from certain tasks of psychosexual growth not being resolved at the appropriate stages of development (Freud, 1914). More specifically, he understood psychotic symptoms as repressed ideas or unresolved conflicts within personality coming into streams of conscious thinking, and hallucinations as a projection of unconscious wishes and processes, like those found in dreams. Related to Freud's perspective on psychosis, Bion (1962) understood everyone to have psychotic and non-psychotic aspects to their personality, with the psychotic aspects becoming more apparent during times of anxiety and stress. Consequently, Bion viewed hallucinations as a mechanism to cope with difficult emotions involving a process of extreme projective identification.

Klein (1946) attempted to explain psychosis from a maturational perspective, focusing on the ways psychotic individuals manage unconscious internal conflict as babies. Accordingly, primitive defences, such as projection, introjection and object relations, are thought to interrupt normal development of the ego and limit the capacity for symbolic thinking. When the primitive defences break down, a vulnerability to psychosis is created by the resulting disrupted sense of reality. Therefore, it appears that psychoanalytic theories in general typically view symptoms of psychosis as a defence mechanism that involves a projection of intolerable emotions onto others when under perceived threat. Such a pattern of unconscious conflict is thought to be characteristic of individuals with a fragile ego (Jackson, 2001).

In terms of the application of psychoanalytic models to the treatment of psychosis, Malmberg & Fenton (2001) carried out a literature review of the effects of individual psychoanalytic and/or psychodynamic psychotherapy in people with schizophrenia. They reported that no research trials had been carried out using a psychoanalytic approach in this population, and in the evidence that did exist, that there was no indication of a positive effect of psychodynamic therapy in the treatment of schizophrenia. Such a review highlights the lack of research and

evidence to support the application of psychoanalytic models in psychosis. Therefore, in spite of these seemingly plausible explanations for psychotic symptoms, the underlying psychoanalytic theories have limitations, namely that they are difficult to scientifically evaluate and fail to account for important biological and social components of psychosis (Lemma, 2003).

1.3.2. Neuropsychological Theories

On the other hand, neuropsychological theories aim to explain specific psychological processes such as thinking and behaviour in terms of functions of the brain. In so doing, they often take an information-processing approach to understanding the human mind whereby the brain is viewed similarly to a computer, involving a cycle of processing incoming data into meaningful information (Frith, 1992). Consequently, neuropsychological theories of psychosis attempt to explain characteristic patterns of disrupted thinking and behaviour in terms of disrupted processes within the brain, such as impaired self-awareness and self-monitoring discussed below.

From a review of the literature on test performance in schizophrenia, Heinrichs & Zakzanis (1998) suggested schizophrenia was largely characterised by a general level of cognitive impairment, which included deficits across all neurocognitive domains. Therefore, suggesting that a continuum of functioning may best account for the variable neurocognitive deficits found in psychosis, ranging from mild dysfunction (which may also appear in healthy individuals) to severe dysfunction (which may be considerably different from healthy individuals) (Heinrichs *et al.,* 1998). Such a model can partly account for the reported impairment of cognitive functions in psychosis, whilst providing an explanation for the estimated 50% of people with psychotic disorders who have average neurocognitive functioning.

Given that no single model of the relationship between brain abnormality and psychotic experiences exists, Frith has proposed that attention should be drawn to the processes that underlie specific symptoms of psychosis, rather than identifying specific cognitive deficits (Frith, 1992). More specifically, Frith (1996) postulated that the unusual behaviour of people with schizophrenia principally reflects a problem with the regulation of self-generated acts and impaired self-awareness. Auditory hallucinations in particular have been associated with areas of the brain that involve the perception of auditory verbal material and mediate the generation of inner speech, such as the cortical regions (McGuire *et al.,* 1995). McGuire *et al.* (1995) compared samples of people with and without hallucinations to examine the neural

correlates of tasks involving inner speech. From their study they concluded that auditory hallucinations are associated with a failure to activate the neural correlates involved with monitoring of inner speech. Similarly, Plaze *et al.* (2006) studied 15 patients with schizophrenia and reported that the experience of auditory hallucinations uses the same neurological structures as those used for generating normal speech within the temporal cortex. Evidence such as this indicates the involvement of similar neurological processes in the generation of speech as the generation of auditory hallucinations.

From a different perspective, Hemsley (1993) presents a neuropsychological model that accounts for positive symptoms of psychosis, such as hallucinations and delusions, as a product of intrusions from long-term memory. Accordingly, experiences associated with intense arousal, such as traumatic events, are understood to impair an individual's ability to process incoming information in a way that is integrated into a temporal and spatial context. The strength with which this emotionally salient information is encoded subsequently influences the frequency and nature of intrusive experiences, and can result in an information processing style characterised by disrupted cognitive inhibition.

Similarly, Weinberger's (1987) neurodevelopmental perspective on schizophrenia proposes that the pathology underlying its development and course is established early in development. The author suggests that a predisposition to schizophrenia may occur when neurocognitive vulnerabilities established early in life, such as a lesion, later interact with changes associated with normal brain development. Accordingly, this model of schizophrenia highlights the disruptive effects of stress on the development of neural structures and systems within the brain (particularly in the prefrontal cortex).

Furthermore, an additional neurodevelopmental perspective of psychosis has been presented by Read *et al.* (2001) in their account of the effects of trauma on the developing brain in their 'traumagenic neuro-developmental model' of schizophrenia. In their detailed discussion of this model, Read *et al.* (2001) interpret the heightened sensitivity to stress that is characteristic of people with schizophrenia to be the result of neurodevelopmental and biological changes associated with childhood trauma. They argue that similarities in the neurocognitive disturbances detected in the developing brain of a child affected by trauma and the brain of adults diagnosed with schizophrenia can be attributed to negative life events. More specifically, Read *et al.* (2001) suggest that childhood trauma contributes to later psychological dysfunction by a process of disruption to the brains homeostatic response to stress in the hypothalamus (the homeostatic hypothalamic-pituitary-adrenal axis response).

Accordingly, this model suggests the disruptive impact of traumatic early life events can create a vulnerability to cognitive disturbance and disrupted emotion regulation, which can then be triggered by further experiences of stress.

To summarise, neuropsychological theories attempt to explain disrupted patterns of thinking and behaviour commonly observed in psychosis in terms of disrupted functioning of the brain (Firth, 1992). The findings above indicate that disrupted cognitive processes, such as self-awareness and self-monitoring, are important in the development and maintenance of symptoms of psychosis. Evidence such as that presented by Plaze *et al.* (2006) and McGuire *et al.* (1995) particularly highlights the deficits associated with perception and misattribution of inner speech in auditory hallucinations. It also appears that these key neurocognitive processes can be further understood in the context of disrupted neurodevelopment, involving the interaction of stressful life events and development of the brain (Read *et al.* 2001; Hemsley, 1993). Such evidence highlights the effect of stress in disrupted neurodevelopment and is of particular interest in the study of psychological factors associated with psychosis.

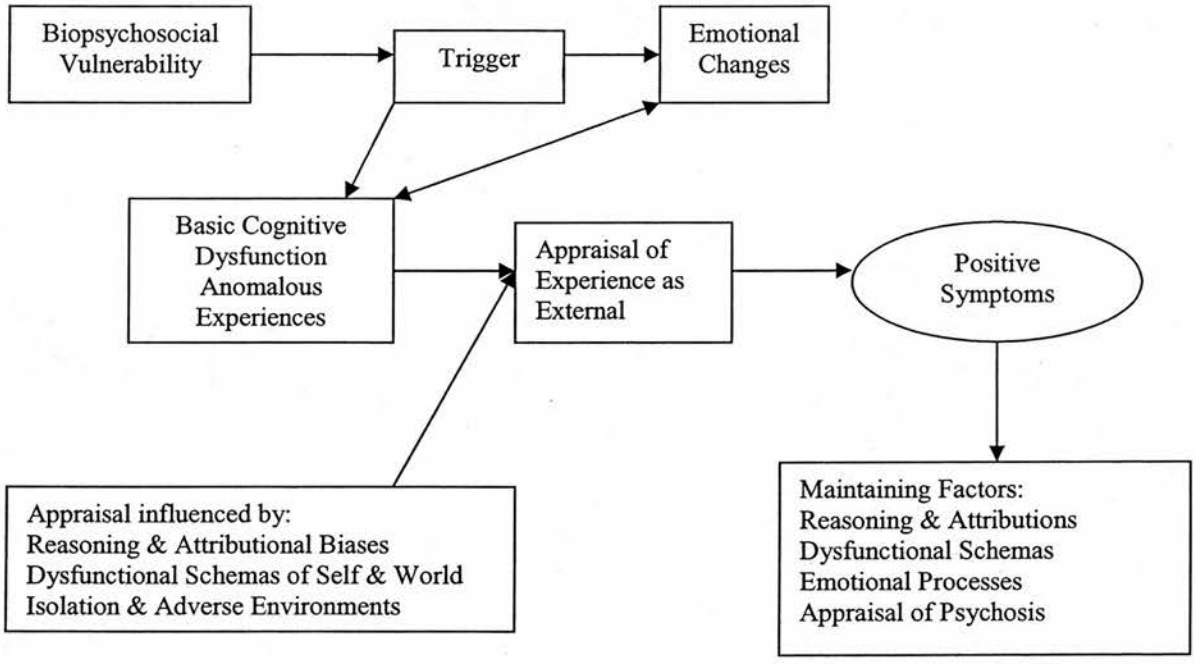
Furthermore, Heinrichs & Zakzanis' (1998) conclusions about varying degrees of cognitive impairment underlying the disrupted neurocognitive processes associated with psychosis, suggest it is possible to understand these deficits in terms of a continuum of functioning, which further supports the continuum model of psychosis described above (Johns & Van Os, 2001; Myin-Germeys *et al.* 2003). However, as yet no one comprehensive model exists that incorporates the various processes involved in psychosis. It is possible that this is largely a reflection of the complex aetiology of brain functioning relating to psychosis and suggests that there is likely no unitary deficit underlying psychosis.

1.3.3. Cognitive Theories

As described above, disrupted processes of self-monitoring and self-awareness have been indicated as important in the development of psychosis. Neuropsychological theories account for these processes in terms of disrupted functioning in the brain, whilst cognitive theories attempt to explain them in terms of biased thinking (Morrison, 2002). Therefore, in addition to the neuropsychological explanations presented above, an understanding of the cognitive processes considered to be important in psychosis is relevant to the current study and has been summarised below. More specifically, cognitive models attempt to account for psychotic symptoms as a variation of everyday experiences, rather than as a deficit or disease. Maher (1988) for example proposed that the cognitive processes associated with psychosis are normal explanations for unusual experiences. Accordingly, disruptions to normal processes, such as perception, attribution and reasoning, are viewed as central to cognitive models of

hallucinations and delusions, and can be understood within a social, cultural and developmental context. The following model (originally presented by Kuipers, *et al.* 2006) presents a comprehensive summary of these key cognitive processes that will be discussed in greater detail (see Figure 1).

Figure. 1. A Cognitive Model of Positive Symptoms of Psychosis presented by Kuipers *et al.* (2006).



As detailed in Figure 1, the recurrent appraisal of internal experiences as personally meaningful and externally caused has been indicated as a key process in hallucinations and delusions. Auditory hallucinations in particular have been identified as occurring from the misattribution of internal mental experiences to external stimuli. Baker & Morrison (1998) compared two clinical samples and one non-clinical samples' performance on a source monitory task. From their research, the authors found that individuals who experience auditory hallucinations misattribute internal events as external to a greater extent than those who do not. Such an attribution style, characterised by an impaired ability to distinguish between internal and external events, is supported by other research that has drawn similarities between inner speech and auditory hallucinations (Bentall, 1990; Leudar & Thomas, 2000).

Meta-cognitive beliefs relating to unusual internal experiences are also indicated as instrumental in the occurrence of symptoms of psychosis. Morrison *et al.* (1995) hypothesised

that when meta-cognitive beliefs are not congruent with intrusive thoughts, people with hallucinations tend to externally attribute the thoughts. Accordingly, Morrison *et al.* (1995) propose that the reduction in cognitive dissonance maintains the biased meta-cognitive beliefs and the subsequent psychotic appraisal.

Information processing biases such as those described by Garety & Freeman (1999) also appear to be influenced by emotional states and so tend not to be stable over time. There is evidence to suggest that an increase in the experiences of auditory hallucinations is associated with an increase in physiological arousal and heightened perception, with some models accounting for emotional stress as a precursor to hallucinations. Other models however focus on the maintenance effect of emotional state. Freeman & Garety (2003) and Garety *et al.* (2001) for example, explain the association of emotion with symptoms of psychosis by suggesting that negative emotional states, such as anxiety and depression, are likely to contribute to cognitive biases and the maintenance of hallucinations and delusions.

In terms of the application of cognitive models to the treatment of psychosis, cognitive therapy has increasingly been evaluated in treatment trials, such as that carried out by Morrison *et al.* (2004). In a study which randomly allocated patients (n=59) with psychosis to a treatment condition involving cognitive therapy or a waiting list condition, Morrison *et al.* (2004) found a significant improvement in patients' symptoms in the cognitive therapy treatment condition. Therefore, from their research in clinical practice, the authors concluded that cognitive therapy is an efficacious treatment for psychosis, which provides support for the cognitive model of psychosis.

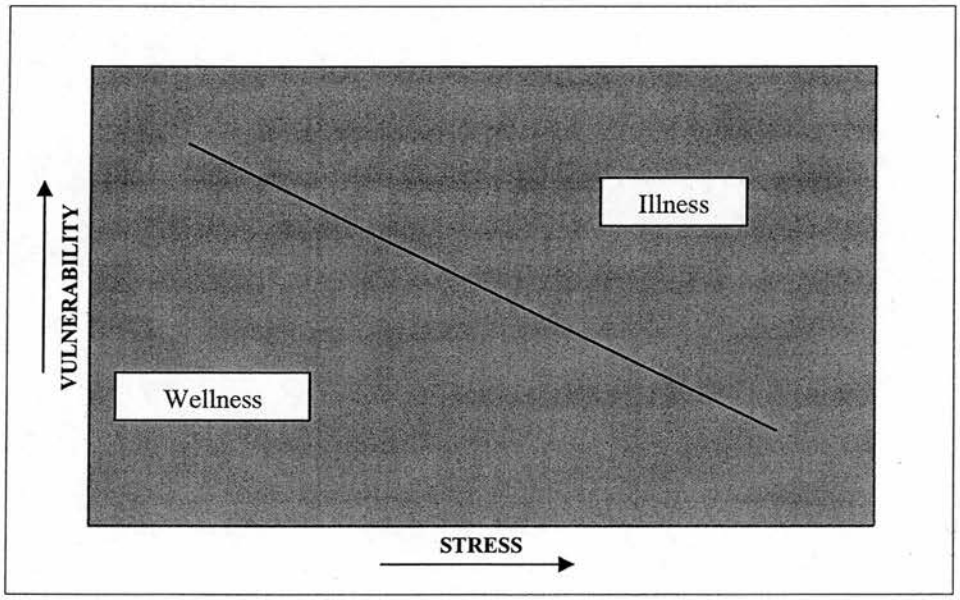
In summary, cognitive models of psychosis appear to offer multi-dimensional perspectives on the cognitive processes underlying symptoms of psychosis, especially auditory hallucinations. Although there is no one conclusive cognitive model that exists, the literature reviewed above highlights the influential role of biased reasoning, meta-cognitions and emotions in psychosis. In their model Kuipers *et al.* (2006) summarise the complex interaction between cognition and emotion, alongside the role of developmental and environmental factors in the cognitive biases associated with hallucinations and delusions. Therefore, a comprehensive cognitive perspective of psychosis appears able to account for cognitive processes associated with hallucinations and delusions, alongside the role of vulnerabilities, including neuropsychological deficits and disrupted neurodevelopment as outlined above. Consequently, models such as Kuipers *et al.'s* (2006) facilitate an understanding of the cognitive processes that may contribute to the development of auditory hallucinations and

other biological and social factors. Nevertheless, given there is no one definitive model of psychosis, research is ongoing into the effect of key factors, such as trauma, and the key cognitive processes that may underlie those associations.

1.3.4 Psychosocial Theories: Diathesis-Stress

So far, specific theoretical models have been discussed and limitations outlined within the context of the current study. However, of all the models that account for mental illness, the diathesis-stress model offers utility to account for the role of psychosocial stress in the development of psychotic symptoms in vulnerable individuals. From Wing *et al.'s* (1964) initial description of 'stress reactivity', further models of vulnerability have evolved to account for the interaction of psychological, social and biological processes involved in mental illness. The diathesis-stress model described by Zubin & Spring (1977), which is commonly referred to as the 'stress-vulnerability model', was developed to explain the unique interaction between the different factors involved in schizophrenia and offers a multi-factorial understanding of mental illness (as outlined below in Figure 2).

Figure 2. Zubin & Spring's Stress-Vulnerability Model.



From a psychological perspective, the stress-vulnerability model of psychosis facilitates the integration of neuropsychological and cognitive processes associated with psychosis in the context of additional psychosocial factors. The evidence for such processes in the predisposition to hallucinatory experiences and other psychotic symptoms has grown. Zubin & Spring's (1977) work indicates psychosocial factors such as trauma as a potential trigger for schizophrenia in vulnerable individuals whilst Read (1998) examined the causal role of

factors such as trauma in 'acquired vulnerability' to psychosis. Similarly, Honig *et al.* (1998) investigated precipitating factors in patients with schizophrenia and reported an external trigger for the onset of hallucinations in 65% of cases. Evidence such as this suggests that the onset of auditory hallucinations may often be preceded by either a traumatic event or an event that activates the memory of the earlier trauma. This highlights an interaction between key psychological predisposing and precipitating factors in the development of psychosis.

Other psychological factors such as dissociation (Butler *et al.* 1996), personality traits (Anand *et al.,* 2006), and mood have also been indicated as contributing to the development of psychosis. In terms of both dissociation and personality traits, Butler *et al.* (1996) reported from their study of stress and vulnerability in patients with psychiatric disorders, that dissociative experiences and personality traits associated with psychosis (i.e. schizotypal personality traits) are related to participant's perception of stress. From this evidence it appears that dissociation and personality factors can sensitise an individual, and lower their threshold to stress, comparative to others without such psychological vulnerabilities. Research has more specifically indicated a strong association between a vulnerability to psychosis and lifetime Axis I diagnoses, particularly anxiety and mood disorders (Svirskis *et al.,* 2005). However, in order to better understand the nature of these different relationships, the key findings have been explored and summarised in greater detail below, and their implications discussed.

To summarise, the stress-vulnerability model of psychosis appears to present a framework that integrates the variable contribution of different vulnerability and stress-related factors to mental illness. The evidence summarised above suggests trauma, dissociation, personality traits and mood are important factors that may contribute to symptoms of psychosis. Accordingly, it is possible that these factors of vulnerability, contribute to the key neuropsychological and cognitive processes associated with hallucinations described previously (such as disturbed self-monitoring and processes of misattribution and biased reasoning). However, to further understand the association between these different psychological factors and hallucinations, recent related literature is reviewed below.

1.4. Psychological Predisposing Factors

As evidence in support of the stress-vulnerability model of psychosis suggests (Zubin & Spring, 1977), trauma, dissociation and schizotypal personality are factors that may contribute to symptoms of psychosis, such as hallucinations. Nevertheless, there remain questions about the nature of these associations and how strongly they are associated. Consequently, evidence to support our current understanding of the association between these factors and psychosis will be presented, and the implications of these findings discussed below, with a view to identifying shortcomings in the current evidence base and guiding future research.

1.4.1. Psychosis & Trauma

As outlined previously, trauma has been indicated as a predisposing and precipitating factor in psychosis (Read *et al.,* 1998; Honig *et al.,* 1998). Studies over recent decades have measured the prevalence of trauma events in samples of patients with psychosis, yet the nature of the association between trauma and symptoms of psychosis remains less well understood (Morrison & Peterson, 2003).

With an estimated 70% of the general population exposed to some level of trauma in their lifetime (Lee & Young, 2001), exposure to such events often leads to intrusive memories or flashbacks relating to the event as an adaptive psychological process (Mazillier & Steel, 2007; Ehlers & Clark, 2000). In more extreme cases, repeated trauma-related intrusions have been associated with a range of disordered symptomatology, long-term distress and disruption to social functioning. Mueser *et al.* (1998) for example reported the prevalence of trauma to be particularly elevated in people with severe mental illness, whilst an association between trauma and psychosis is suggested by the high incidence of trauma in samples of patients with schizophrenia (Read *et al.,* 2001). Read & Argyle (1999) on the other-hand explored the content of symptoms in an adult inpatient sample of people diagnosed with schizophrenia with histories of abuse. From their inpatient sample, Read & Argyle reported that 54% of the content of symptoms related to their experiences of childhood abuse.

It is apparent from these studies that there is no one definitive measure of trauma, which possibly reflects the multi-dimensional nature of traumatic experiences, yet limits the strength of the conclusions that can be drawn from the existing evidence (Bendall, 2008). Common methods of measuring trauma exposure have included collecting data from patient's case notes and using of a standard measure such as the Trauma History Questionnaire (Green, 1996). Nevertheless, there are several dimensions important in the quantification of trauma, including the nature of the trauma experience (i.e. physical, sexual or emotional), the stage of development when the traumatic experience occurred (i.e. childhood or adulthood), and the

frequency of the trauma (i.e. single or multiple). In order to review the literature in support of the trauma-psychosis association systematically, the evidence has been summarised in terms of the stage of development at which the traumatic experience occurred, given that this seems to be the most common dimension of trauma reported in the literature. However, summary of the literature by type or frequency of trauma could have been equally appropriate.

Trauma that occurs during childhood has been identified as a causal factor in a number of adult disorders including depression, anxiety, posttraumatic stress disorder (PTSD) and personality disorders (Horowitz *et al.,* 2001). Research over recent decades has found childhood abuse to be a common factor in the histories of individuals with psychosis, which has been supported by the findings of a four-year prospective study that reported rates of psychotic-like symptoms in the general population to be 0.7% in individuals who had not experienced childhood abuse, and 2.6% in those who had experienced childhood abuse (Bijl *et al.* 1998). Similarly, Read *et al.* (2003) explored the effects of different types of abuse during childhood and adulthood on hallucinations, delusions and thought disorder, and reported hallucinations to be significantly more common in patients with a history of child abuse than in those patients without. Research findings such as these suggest an association between childhood abuse and psychosis in clinical and non-clinical populations.

More specifically, Greenfield *et al.* (1994) presented evidence for childhood sexual abuse increasing the risk of developing psychotic symptoms whilst Read & Argyle (1999) explored the effects of different types of abuse in a psychiatric inpatient sample. Interestingly, Read & Argyle (1999) discovered little difference in the prevalence of hallucinations amongst those subjected to childhood sexual abuse (58%) and those who were subjected to childhood physical abuse (53%). However, they reported a greater prevalence of hallucinations in those survivors who had experienced both types of abuse (71%). They also reported that female incest survivors were more likely to experience hallucinations than those subjected to extra-familial childhood sexual abuse, which emphasises an effect of the nature of abuse and the individual's relationship with the abuser, in the subsequent development of psychosis. Ross *et al.* (1994) also found that out of the key symptoms of schizophrenia, auditory hallucinations experienced as voices commenting on thoughts or actions had the strongest relationship with childhood abuse.

Despite substantial evidence of an association between trauma and psychosis, there is limited research from which it is possible to interpret the direction of causality for this relationship. From retrospective studies such as those carried out by Ross *et al* (1994), Read & Argyle (1999) and Read *et al* (2003) it is not possible to directly conclude that childhood trauma

causes psychosis, and any such interpretation of the reported relationship between these two factors could only be made at a speculative level. Accordingly, such studies are limited to providing information about the strength of an association between childhood trauma and psychosis, rather than information about the direction of causality. On the other hand, those studies that have used prospective methodologies to investigate the association between trauma and psychosis offer valuable information about the causal relationship between these two factors. Bijl *et al*'s (1998) study in particular provides evidence for childhood trauma as a causal factor in psychosis which can contribute considerably to current models for understanding factors involved in the development of psychosis. Consequently, in an evaluation of the evidence for a relationship between childhood trauma and psychosis, it is important to distinguish between the evidence which clearly demonstrates an association between these two factors retrospectively, and the evidence which importantly considers the causal relationship between these two factors using prospective methodologies.

In addition to the evidence for childhood sexual and physical abuse as factors associated with symptoms of psychosis in general and hallucinations in particular, there is also evidence which indicates an association between adulthood trauma and symptoms of psychosis, such as hallucinations. For example, reported rates of adult sexual and physical abuse appear to be high in both male and female psychiatric samples (Goodman *et al*, 1997) and Read *et al.* (2003) also found adult sexual abuse to be related to hallucinations, delusions and thought disorder. More specifically, Goodman *et al.* (1997) reported that in a sample of chronically mentally ill outpatients, the rates amongst female survivors of physical abuse in adulthood were greater (90%) than those for sexual abuse in adulthood (79%), whilst rates amongst male survivors of physical abuse in adulthood were similarly high (71%) yet significantly less for sexual abuse in adulthood (19%). In addition to the effect of gender, there is evidence to suggest that the relationship between childhood sexual abuse and hallucinations becomes even stronger when followed by a sexual assault during adulthood (Briere *et al.,* 1997). Consequently, it follows that the experience of abuse during childhood may be a risk factor for being abused as an adult and in part may explain the relationship between child abuse, adult abuse and symptoms of psychosis.

Morrison & Peterson (2003) reported an effect of trauma on the predisposition to hallucinations from a non-clinical sample of 64 adults. Within their study, the authors reported that trauma events relating to bereavement, physical assault and emotional abuse had a significant effect on auditory hallucinations, with bullying relating to visual hallucinations. Similarly, Kilcommons & Morrison (2005) investigated the association between severity of trauma and symptoms of psychosis in a sample of people with psychotic disorders. They

reported a moderate association between lifetime trauma and hallucinations (r=.34) and a more specific significant association between sexual abuse and hallucinations. However, they identify the need for further research to clarify the relationship between types of trauma events and symptoms of psychosis.

These findings from clinical and non-clinical samples suggest that trauma is associated with both symptoms of psychosis and milder psychotic-like experiences. More specifically, this evidence suggests that types of trauma relating to physical, emotional and sexual abuse are associated with hallucinations, whilst the degree to which these specific trauma events are associated remains unclear and requires further investigation. However, despite the evidence of an association between trauma and psychosis, the exact pathways by which trauma leads to hallucinations are complex and remain unclear.

From a cognitive perspective, Briere (2000) understands the occurrence of memories and flashbacks of past abuse, in the form of hallucinations, as an attempt to integrate traumatic experiences and the result of a disrupted processing of information into memories. Within this self-trauma model, Briere conceptualises processes of avoidance and numbing, such as suppression, dissociation and substance misuse, as methods of affect regulation. Equally, a more neuro-developmental perspective considers the potentially disruptive effects of adverse childhood experiences on the developing brain of a child (Read *et al.,* 2001). As previously mentioned, Read *et al.* (2001) specifically acknowledge the role of the body's response to stress (involving activation of the hypothalamic-pituitary-adrenal axis), which can become compromised by experiences of stress as a child, and create a vulnerability to extreme emotional reaction and cognitive disturbance when re-traumatised.

On the other hand, Steel *et al.* (2005) consider the role of contextual integration in trauma-related intrusions. They argue that the disrupted integration of trauma-related experiences may be a significant factor influencing the relationship between trauma and psychosis. More specifically, they propose that individual differences in schizotypal personality traits influence the ability to contextually integrate trauma-related information and therefore mediate the relationship. Models such as these demonstrate the variable and multifaceted effects of trauma on the predisposition to symptoms of psychosis.

Hardy *et al.* (2005) present an alternative model of the association between trauma and hallucinations, by proposing four different pathways: (i) direct (ii) indirect (iii) stress, and (iv) trauma not contributing to hallucinations at all. In support of a direct relationship between trauma and hallucinations, Hardy *et al.* (2005) found that 12.5% of a sample of patients with

psychosis experienced hallucinations that directly mirrored their experiences of trauma, in terms of both theme and content. Such evidence suggests a direct relationship between trauma and hallucinations. However, a larger proportion of the sample (45%) experienced hallucinations that were similar in theme, but not content, as their experiences of trauma, therefore also suggesting an indirect relationship. Equally, 42.5% of the sample reported hallucinations that showed no reflection of previous trauma, thus demonstrating no relationship. The authors also reported that those traumas rated as most intrusive (such as sexual abuse and bullying) were found to be significantly associated with those hallucinations that were rated as intrusive. This suggests that there may be an indirect relationship between experiences of trauma and hallucinations for almost half of people with psychosis.

Given the complex relationship between trauma and psychosis, parallels have been drawn between the symptoms and constructs underlying psychosis and PTSD as responses to trauma. In particular, similarities have been drawn between the intrusive thoughts associated with psychosis and PTSD. From their study of the relationship between trauma and psychosis, Holmes *et al.* (2004) proposed that both psychosis and PTSD are part of a spectrum of responses to trauma, and highlighted the role of post-traumatic symptomatology in the onset and maintenance of psychotic disorders. Such hypotheses suggest that the relationship between trauma and psychosis is not a linear one. Consequently, it seems important to not only recognise evidence of the contribution of trauma to psychosis but also the evidence which indicates psychotic experiences in themselves as traumatic and in turn leading to post-traumatic stress symptomatology (Morrison *et al.,* 2003).

From the different theories discussed above, it is apparent that consideration has been given to the neuro-developmental (Read *et al*, 2001), cognitive (Briere, 2000; Steel *et al*, 2005), and emotional (Briere, 2000) processes associated with trauma within the context of the bi-directional relationship between trauma and psychosis (Morrison et al, 2003). Given that these perspectives do not seem to be mutually exclusive, together they may offer a valuable model for the development and maintenance of symptoms of psychosis. In particular, Read *et al*'s (2001) account of the disruptive effect of early trauma on neurobiology highlights the neurodevelopmental vulnerability factors associated with psychosis which can be further understood in the context of important cognitive processes. More specifically, Steel *et al* (2005) consider the cognitive style associated with schizotypal personality as important in the development of psychosis due to a related weakened contextual integration of trauma-related information. Accordingly, such a compromised cognitive style is considered to render an individual at risk of subsequent intrusive thoughts, which may be experienced as flashbacks or hallucinations.

Although unrelated to personality factors, Briere (2000) appears to offer a similar account of the trauma-psychosis relationship to Steel *et al* (2005), in that hallucinations are viewed as an attempt to integrate trauma-related memories which have not been sufficiently processed. Importantly, Briere (2000) considers processes of avoidance and dissociation as important means of affect regulation which compromise the effective processing of such distressing memories, and contribute to the maintenance of the symptoms of psychosis. Therefore, taken together these separate theories seem to present a comprehensive model of the role of trauma in the development and maintenance of symptoms of psychosis.

In summary, evidence has been presented which supports an association between trauma and psychosis in general (Read *et al.*, 2001) and hallucinations in particular (Morrison & Petersen, 2003). A trauma-psychosis association suggests that trauma may act to predispose an individual to developing symptoms of psychosis, whilst also acting as a trigger for psychosis in vulnerable individuals. More specifically, an association between childhood sexual abuse and hallucinations has been demonstrated (Read *et al.*, 2003), and this appears to strengthen when followed by abuse as an adult, particularly sexual abuse (Briere *et al.,* 1997). However, research of the trauma-psychosis association seems to have been challenged by quantification of the multi-dimensional nature of trauma events, and limited prospective research exploring the causal relationship between these factors, alongside limited exploration of the association between trauma and psychotic-like experiences in the general population.

The range of hypotheses regarding the mechanisms by which trauma leads to psychosis suggests there are many direct and indirect pathways, although as the current review highlights, the exact nature of these pathways remains unclear. As recommended by Kilcommons & Morrison (2005) and Morrison & Peterson (2003), further research is required to more fully understand the association between specific types of trauma and hallucinations. Furthermore, research is also required to more fully understand this association in the context of other factors associated with psychosis. Exploration of this association has been limited to samples of participants with psychotic disorders and, as yet, a cross-sectional analysis of the trauma-psychosis association does not seem to have been carried out. Therefore, to further explore the trauma-psychosis association in the context of the continuum model of psychosis (Krabbendam *et al.,* 2004), it seems important for such research to be carried out across clinical and non-clinical populations.

1.4.2. Psychosis & Dissociation

As discussed previously, evidence in support of the stress-vulnerability model of psychosis indicates dissociation in the development of psychosis (Butler *et al.,* 1996), alongside other psychological factors such as trauma and schizotypal personality. Such an integrated perspective contrasts with psychiatric models of dissociation as a diagnostic construct separate from psychosis (as outlined in the DSM-IV). However, findings from recent investigations of the dissociation-psychosis link suggest that dissociation may be a further factor involved in the development and maintenance of psychosis (Moskowitz *et al.*, 2005). In view of such recent research, it seems to be an important process to consider in the context of other psychological factors associated with psychosis. Therefore, to further understand this relationship, existing evidence for the dissociation-psychosis association will be presented below.

Janet (1925) was the first to introduce the concept of dissociation, which he understood as a psychological defence against traumatic life experiences. Interestingly, Janet's understanding of dissociation is mirrored today in more recent definitions of dissociation, such as that described by Coleman (2003, pp.211): "partial or total disconnection between memories of the past, awareness of identity and of immediate sensations, and control of bodily movements". Janet proposed that the process of separation of painful material from the rest of the psyche occurs at a subconscious level and can serve a functional role during intense distress. Furthermore, Janet acknowledged that in extreme cases of splitting of traumatic material from consciousness, dissociation could result in processes of amnesia and depersonalisation.

Janet's original conceptualisation of dissociation as a mechanism to cope with stressful experiences remains utilised today. As such, many studies have consistently found high degrees of dissociation in patients who suffer from psychological disorders. In particular, evidence has indicated dissociation as a common symptom of post-traumatic stress (Van der Hart & Horst, 1989) and psychosis (Moskowitz *et al.,* 2005). It is also interesting to note that Bleuler's (1911) original description of the splitting of the psychic functions in schizophrenia is very similar to modern conceptions of severe dissociation. However, this comparison is not surprising, given the striking similarity between the key characteristics of dissociation and psychosis, such as identity alteration, depersonalization and derealisation. Consequently, recent research has suggested a possible overlapping of processes that underlie both symptoms of dissociation and psychosis (Moskowitz & Corstens, 2007).

Dissociation has predominately been understood on a continuum of severity, similar to that of schizotypal personality traits. A dimensional perspective accounts for the milder forms of dissociation such as daydreaming, alongside the more extreme forms, such as dissociated identity (Carlson & Putnam, 1993). However, this model of dissociation has been rejected by some who argue that the milder processes of dissociation are qualitatively distinct from more pathological dissociative states (e.g. Cardena, 1994). Cardena (1994) proposed three dissociative categories, whereby the milder forms of dissociation are conceptualised as non-pathological and include everyday phenomena such as divided attention and disrupted memory processes.

For the more extreme forms of dissociation, Cardena distinguishes between those presentations that involve pathological states of altered consciousness and more functional dissociation as a mechanism of defense. This categorisation has been supported and advanced by other researchers including Allen (2001) and Holmes *et al.* (2005) who agree on two general categories of dissociation, that which is functional and that which is pathological, since at its most extreme, dissociation can cause severe dysfunction in an individual's life. However, it still seems possible to interpret Allen (2001) and Holmes *et al.*'s (2005) distinction between 'detachment' and 'compartmentalization' within the context of a continuum rather than two opposing models of dissociation.

A widely used measure of dissociative experiences is the Dissociative Experiences Scale (DES: Carlson & Putnam, 1993), which measures everyday, functional experiences of dissociation, alongside more severe dissociative symptoms. With the extensive use of the DES in clinical research, there is much evidence to support its validity and reliability as a measure of dissociation. Irwin (1994) for example studied patients with high DES scores from which he reported the main predictors of dissociation to be familial loss in childhood and sexual abuse (intrafamilial and extrafamilial). Findings such as these demonstrate the level of dissociative disturbance prevalent in those with a history of trauma. More specifically, Startup (1999) reported that severity of trauma experiences correlate significantly with degree of dissociation. Van der Kolk *et al.* (1996) reasoned that once people learn to dissociate in response to trauma, they tend to continue to do so in the face of subsequent stress. Consequently, continued dissociation may not only interfere with the conscious processing of current information; but also prevent individuals developing new ways of coping, and interfere with adaptive functioning.

Given the strong association between trauma and dissociation, their relationship has been well researched and documented (e.g. Nijenhuls *et al.,* 1998). However, the relationship between

dissociation and psychosis remains less well understood, despite suggestion of a strong link between the two experiences. Studies carried out by Allen *et al.* (1996 & 1997) and Moskowitz *et al.* (2005) reported DES scores to correlate strongly with psychotic profiles indicating dissociation to be a strong contributor to psychoticism and schizophrenia. Moskowitz *et al.* (2005) specifically assessed the relationship between dissociative and psychotic experiences in samples of university students and prison inmates. They found strong correlations between DES scores, psychoticism and paranoid ideation subscales (of the SCL-90-R), which replicates results from previous studies using different methodology and measures. It is also interesting to note that Ellason & Ross (1997) reported positive schizophrenic symptoms to be more common in dissociative identity disorder than in schizophrenia.

More recently, Perona-Garcelan *et al.* (2008) studied dissociation across 68 participants with and without auditory hallucinations, and specifically recruited participants into four groups: patients with a psychotic disorder who suffer from auditory hallucinations, patients with psychoses who have recovered from their hallucinations, patients with psychoses who have never had them and a non-clinical group. From their findings, the authors report that patients with hallucinations and those who had recovered from them had a higher percentage of dissociative experiences (as measured by the DES and its 3 subscales) than the other clinical and non-clinical groups. Interestingly, they found the depersonalization factor to be the only factor in the DES to predict auditory hallucinations. Kilcommons & Morrison (2005) also reported a strong association between the depersonalisation and derealisation subcomponent of dissociation and hallucinations ($r=0.59$). However, Perona-Garcelan *et al.* (2008) highlight the limitations of their small sample size and recommended for future research to explore the dissociation-psychosis link in clinical groups with psychopathologies other than psychosis.

Consequently, the strong correlation between dissociation and psychosis has been replicated in different studies, despite variations in samples and measures. This is demonstrated in an amended summary of the key research data originally presented by Moskowitz *et al.* (2005), presented in Table 1.

Table 1. Correlations between the DES and measures of psychosis, psychoticism or schizotypy (an amended summary replicated from Moskowitz *et al.* (2005) (Table 1))

Authors	N	Measures	r
Allen *et al.* (1996)	75	BSI (Psychoticism Scale)	0.46
Allen *et al.* (1997)	102	Million Clinical Multiaxial Inventory (3rd Ed) & Schizotypal Personality Thought Disorder	0.57 & 0.69
Startup (1999)	224	Oxford-Liverpool Inventory of Feelings & Experiences & Unusual Experiences & Cognitive Disorganisation	0.58 & 0.45
Moskowitz *et al.* (2005)	119 /42	SCL-90 (psychoticism & paranoid ideation subscales)	0.52/0.517 & 0.637/0.649

Evidence such as that presented in Table 1 demonstrates the strength of relationship between dissociation and psychosis, however, for the current study it is also important to consider the nature of that relationship in the context of other psychological factors. One recent study carried out by Giesbrecht *et al.* (2007) supports the hypothesis that dissociation may mediate the pathway between early trauma and later psychotic symptoms. However, Giesbrecht *et al.*'s (2007) results suggest other factors are also indicated in this relationship.

In Allen *et al.*'s (1997) study of psychotic symptoms and dissociative detachment, factor analysis of the DES revealed 2 dimensions of dissociative detachment: detachment from one's own actions and detachment from the self and the environment. These dimensions related strongly to thought disorder and schizotypal personality disorder scales of the MCMI-III. From their findings they concluded that severe dissociative detachment contributes to psychotic symptoms and "personality decomposition" by a compromised sense of inner and outer reality (i.e. ones connection with the self and the world), resulting in impaired reality testing, severe confusion, disorganisation and disorientation (Allen *et al.,* 1997, pp.327).

Equally, Allen *et al.*'s (1996) study of dissociation, using the Brief Symptom Inventory, revealed phobic anxiety to have the highest loading in relation to dissociation. From this finding, the authors conclude that anxiety drives a dissociative retreat from reality which creates a vulnerability to psychotic symptoms, through a process of flashbacks (from the activation of traumatic memory networks), impaired reality testing (which undermines individuals grounding in reality) and severely disorganised thinking (which blurs boundaries between past and present, internal and external experiences). Steinberg (1995) also proposed that dissociation might be a reaction to extreme anxiety and subsequent depersonalisation.

In addition to the indirect effects of impaired reality testing and anxiety described above, Moskowitz *et al.* (2005) proposed from their research that dissociative processes directly underlie psychotic symptoms. More specifically, the authors argue that auditory hallucinations are fundamentally dissociative in nature, rather than 'psychotic', and might have pathological consequences in some cases, yet not in others (Moskowitz & Corstens, 2007). They propose that dissociation is sustained by the process of keeping memories of trauma out of awareness, and suggest that dissociative experiences may underlie some or all psychotic symptoms. This perspective fits with Jacob & Nadel's (1998) model of multiple memory systems that accounts for the differing responses of memory to stress and trauma, whereby high levels of stress are understood to impair functioning of the hippocampus and disrupt encoding of spatial and temporal aspects of memory. Consequently, Moskowitz & Corstens (2007) suggest that disruption to the memory systems during trauma may lead to post traumatic symptoms that are dissociative in nature, such as flashbacks or hallucinations, and may impair reality testing, thus leading to psychotic symptoms.

In summary, there appears substantial evidence to support an association between dissociation and psychosis, and trauma, dissociation and psychosis (Allen *et al.*, 1996; Moskowitz *et al.*, 2005; Perona-Garcelan *et al.*, 2008; Startup, 1999). However, the nature of this relationship appears multi-factorial and remains unclear. Plausible explanations include anxiety as a mediating factor in the relationship between dissociation and vulnerability to psychosis (Allen *et al.*, 2006) whilst other researchers have proposed that dissociation contributes indirectly via a process of impaired reality testing (Allen *et al.*, 1997). Moskowitz *et al.*, (2005) on the other-hand propose that dissociation more directly underlies symptoms of psychosis.

The evidence summarised above suggests the role of dissociation in the development of psychosis, and raises an interesting debate about the role of dissociation in hallucinations. However, further investigation is required to better understand this relationship in the context of other psychological factors. It also appears that there has been limited research into the dissociation-psychosis association from a cross-sectional perspective. Furthermore, the association does not seem to have been investigated within clinical populations other than those diagnosed with disorders of psychosis. This indicates the need for future research to be carried out across clinical and non-clinical samples to further identify the nature of these associations.

1.4.3. Psychosis and Schizotypal Personality

As previously reported in relation to the continuum model of psychosis, evidence suggests that many of the features associated with psychosis occur to milder degrees within the general population (Johns & Van Os, 2001). Personality as a construct has become increasingly researched to account for some of the variation in the distribution of psychotic-like experiences in the general population, and factors associated with schizotypal personality have been particularly associated with a predisposition to psychotic experiences (Myin-Germeys *et al.,* 2003; Steel *et al.,* 2005). However, this area of research is still in the early stages of development and although evidence suggests that traits associated with schizotypal personality are contributory factors in hallucinations, further research is required to understand the nature of this relationship (Krabbendam *et al.,* 2004).

The term 'schizotypy' was introduced to describe those beliefs, feelings and experiences associated with symptoms of schizophrenia yet not extreme or severe enough to cause distress or indicate disorder (Claridge, 1997). The concept follows from Eysenck's model of personality, in which the term 'psychoticism' is used to refer to one of three key personality traits characterised by unusual thoughts and behaviour associated with psychosis, alongside extroversion and neuroticism (Eysenck, 1993). Currently, it appears that the terms 'schizotypy' and 'psychoticism' are largely interchangeable, with a considerable overlap of the two constructs and their associated traits. Given this apparent overlap, it is interesting to note that Claridge *et al.* (1996) recommend from their analysis of the factor **structure** of schizotypal traits, that the term 'schizotypy' be redefined as 'psychosis-proneness'.

This dimensional perspective identifies the role of personality factors, alongside other experiences, as an alternative to the traditional dichotomous view of psychosis. More specifically, Claridge proposed there to be a continuum between people with low and high levels of schizotypy which provides a framework to understand how individuals may be more or less vulnerable to experiencing hallucinations whilst remaining apparently 'sane'. Evidence to support the validity of the construct comes from findings of an age-related variation in the incidence of schizophrenia, which is paralleled by a similar variability in the age-related expression of schizotypy (Claridge *et al.,* 1996).

Despite the amount of evidence to support the validity of a schizotypal construct, the instruments used to measure schizotypal personality within research appear to have differed extensively. For example, the Schizotypal Personality Scale (Claridge & Brooks, 1984) details that schizotypal personality incorporates four separate factors, including 'unusual experiences', 'cognitive disorganisation', 'introverted anhedonia' and 'impulsive

nonconformity'. The Minnesota Multiphasic Personality Inventory (Golden & Meehl, 1979) has commonly been used in psychiatric populations, yet it emphasises diagnostic classification rather than overall measurement of schizotypal personality traits. On the otherhand, the Rust Inventory for Schizotypal Cognitions (RISC) focuses on the content, rather than the deficit, of key cognitive-perceptual factors of schizotypy in the general population (Rust, 1989).

Given the well-established association between trauma and psychosis, and the proposed vulnerability in individuals with high levels of schizotypy, it is not surprising that there is growing interest in the association between trauma and schizotypal personality traits and post-traumatic experiences. Holmes & Steel (2004) concluded from their research using a non-clinical sample that intrusive experiences are more prevalent among high schizotypal individuals and associated with high schizotypy. More specifically, Steel *et al.* (2005) propose that the information-processing style associated with schizotypal personality and people with psychosis underlies the development of trauma-related intrusions, due to a weakened ability to contextually integrate information into memories, particularly trauma-related information. Accordingly, the processing of information is considered to influence the subsequent development of thoughts and predictions about events in the future and result in characteristic "response biases" (Steel *et al.,* 2005). Therefore, to further investigate this perspective, Marzillier & Steel (2007) explored the relationship between positive schizotypy and trauma-related intrusions, such as hallucinations. From their research they confirmed previous findings that individuals high on schizotypal personality traits were prone to experiencing more frequent trauma-related intrusions and post-traumatic stress symptomatology than those lower on a measure of schizoptypal personality. However, further research into the specific association between schizotypy and intrusive experiences, such as hallucinations, is limited. Similarly, there is limited evidence for the nature of this association in the context of other psychological factors.

Consequently, the evidence so far of an overlap between exposure to traumatic events, schizotypy and symptoms of psychosis (Holmes & Steel, 2004; Marzillier & Steel, 2007) provides support for a model of hallucinations that includes all of these factors. More specifically, as with cognitive models of psychosis, the apparent vulnerability to trauma-related intrusions associated with schizotypal personality can be understood from an information-processing perspective. This style of processing information, characterised by reduced cognitive inhibition and a weakened ability to contextually integrate information into memories, appears to influence the frequency and nature of subsequent intrusive experiences (Peters *et al.,* 1994). Accordingly, schizotypy can be understood as creating a vulnerability to

trauma-related intrusions, such as hallucinations, as proposed by Marzillier & Steel (2007) and Steel *et al.* (2005).

To summarise, the information processing style associated with schizotypal personality presents an interesting perspective for understanding the phenomenon of intrusive experiences like hallucinations, which occur throughout the population, and can present at the more extreme end of the continuum as symptoms of psychosis (Myin-Germeys *et al.*, 2003). Recent evidence has suggested that such an information-processing style influenced by weakened contextual integration is a vulnerability factor for trauma-related intrusions, such as hallucinations, in both clinical and non-clinical populations (e.g. Marzillier & Steel, 2007). Such a cognitive perspective contributes to our understanding of factors associated with symptoms of psychosis, and emphasises the intrusive trauma-related nature of hallucinations in particular. However, this area of research is still in the early stages of development and requires further investigation in relation to hallucinations. Consequently, it is of interest for research to further explore the relationship between schizotypal personality and other factors, involved in the development of hallucinations, trauma in particular, across clinical and non-clinical samples.

1.4.4. Psychosis & Mood

The evidence summarised above suggests associations between trauma, dissociation and schizotypy, in symptoms of psychosis. However, as Kuipers *et al.*'s (2006) model proposes, there is also evidence to suggest the role of emotion, such as anxiety and depression, in symptoms of psychosis. Anxiety, for example, appears to be involved in the formation of hallucinations and delusions (Morrison, 2002), whilst depression may be a secondary response to the experience of hallucinations (Krabbendam *et al.*, 2004). It is therefore of interest to consider how psychological factors are associated with hallucinations in people with clinical levels of anxiety and/or depression, and investigate how their experiences compare to people with psychosis, and people without psychosis or clinical levels of anxiety and/or depression. Consequently, evidence to support the role of anxiety and/or depression in psychosis has been presented below, and considered in the context of the other associations already discussed, and requirements of future research.

Morrison (2002) reported trait anxiety as a predictor of auditory hallucinations and proposed that the cognitive processes involved in psychosis are similar to those involved in anxiety. More specifically, information-processing biases typical of anxiety, such as selective attention, may predispose individuals to developing psychotic symptoms by selectively providing evidence to substantiate psychotic beliefs or schizotypal cognitions. Safety

behaviours may also maintain psychotic symptoms by preventing exposure to disconfirmatory evidence. Equally, meta-cognitive beliefs about psychotic experiences, such as "my thoughts are uncontrollable", may act to influence the development of symptoms and increase overall levels of emotional distress. It is also important to recognise that the experiences of psychosis can be very anxiety provoking in itself and thus maintain the triggered psychotic appraisal, and associated beliefs and behaviours.

In terms of depression, Gutierrez *et al.* (2000) reported a high prevalence of depression amongst those presenting to psychiatric services with first episode psychosis. In fact, nearly half of their sample reported depressive symptomatology within the first 6 months of onset (47%). Similarly, Birchwood & Iqbal (1998) estimated the prevelance of depression to range from 22%-75%. More specifically, research by Krabbendam *et al.* (2004) indicates depressed mood to increase the risk of hallucinatory experiences developing into a psychotic disorder. Consequently, they propose "depressed mood may arise as a secondary response to hallucinatory experiences in the development of clinical psychotic disorder" (Krabbendam *et al.* 2004, pp.418).

In addition to such evidence for depression in the early stages of psychosis, there is also evidence that depression is prevalent in the latter stages of, and post recovery from, psychosis. Iqbal *et al.* (2000) for example reported 36% of a sample of people with psychosis developed post-psychotic depression. They found that those who developed post-psychotic depression felt greater loss, humiliation and entrapment compared to those who recovered from an episode of psychosis without depressive symptomatology. The authors concluded that depression arises in the context of psychosis as a result of individual's secondary appraisal of psychosis. Therefore, those who associate their experience of psychosis with loss and humiliation are more likely to form a depressive appraisal of psychosis and go on to develop post-psychotic depression.

This evidence highlights the role of both anxiety and depression in the development and maintenance of symptoms of psychosis. Cognitive models in particular appear to provide a helpful way to understand the direct and indirect relationships between psychosis and mood, particularly in terms of the information processing biases associated with anxiety, and the sense of loss and entrapment associated with depression associated with the psychotic experience. It seems reasonable to predict that the predisposition to symptoms of psychosis, such as hallucinations and delusions, will be greater in individuals with clinical levels of anxiety and/or depression, than that of the general population. However, the research on

psychotic-like symptoms within this clinical population is limited and further evidence is required to substantiate the findings reported. In particular it seems important for research to be carried out to better understand the effect of mood on other factors associated with psychosis.

1.4.5. Summary & Integration of Predisposing Psychological Factors

The main evidence summarised above demonstrates the relationships that may exist between key symptoms of psychosis, such as hallucinations, and key factors such as trauma, dissociation, schizotypy and mood. Evidence for a trauma-psychosis association suggests that trauma may act to predispose an individual to developing symptoms of psychosis, whilst also acting as a trigger for psychosis in vulnerable individuals. However, it has been deemed necessary to further explore the association between specific types of trauma and hallucinations (Kilcommons & Morrison, 2005; Morrison & Peterson, 2003) to develop our understanding of these experiences and their inter-relationship.

Similarly, evidence for a dissociation-psychosis association supports a link between dissociation and psychosis, and trauma, dissociation and psychosis (Moskowitz *et al.*, 2005) and the relationship between dissociation and hallucinations has been particularly indicated in recent literature (Perona-Garcelan *et al.*, 2008). However, there has been very limited investigation into this association from a cross-sectional perspective, particularly in samples of clinical populations other than those diagnosed with disorders of psychosis. This indicates the need for future research to be carried out across clinical and non-clinical samples to further identify the nature of these associations in the population (Perona-Garcelan *et al.*, 2008).

The information processing style and cognitions associated with schizotypal personality also present an interesting perspective on factors associated with symptoms of psychosis (Myin-Germeys *et al.*, 2003). Recent research in this area has highlighted an interaction between trauma, schizotypy and psychosis, which emphasises the intrusive trauma-related nature of hallucinations in particular (Marzillier & Steel, 2007). Evidence such as this contributes to our understanding of factors associated with psychotic symptoms such as hallucinations, however, it is of interest for research to more fully explore the relationship between schizotypy and other factors involved in the development of hallucinations, across clinical and non-clinical samples.

From the current review, it therefore appears unclear the degree to which these factors influence the development of symptoms of psychosis in the context of other biological and environmental factors. It is also unclear the degree to which these associations vary throughout the population. Consequently, further evidence is required to better understand the key psychological pathways to symptoms of psychosis in general, and hallucinations in particular. It also seems necessary for evidence to be gathered across different clinical and non-clinical groups to better understand the relationships between the different psychological factors within and out with the context of diagnosed psychotic disorders.

1.5. Current Study

1.5.1. Rationale for the Present Study

From the literature summarised above, it is suggested that hallucinations are symptoms that occur on a continuum of severity (Van Os & Johns, 2001; Myin-Germeys, 2003). At the extreme end of the continuum, the occurrence of hallucinations appears to be associated with other symptoms of psychosis, such as delusions, and it is the presentation of hallucinations in the context of other psychotic symptoms that has been most researched. Recent evidence in particular has indicated that trauma (Read *et al.,* 2001), dissociation (Moskowitz *et al.*, 2005; Perona-Garcelan *et al.*, 2008), and schizotypy (Holmes & Steel, 2004) are important in the occurrence of hallucinations, although further research has been deemed necessary (Kilcommons & Morrison, 2005; Krabbendam *et al.,* 2004; Morrison & Peterson, 2003; Perona-Garcelan *et al.*, 2008). Consequently, shortcomings in this area of research have also been discussed.

One particular shortcoming appears to be that events such as trauma and processes such as dissociation and schizotypy have until very recently never been explored together, and have not been explored concurrently across different clinical and non-clinical samples. These factors taken together could be important indicators of hallucinations within and out with the context of psychosis, and it follows that a clearer understanding of the exact factors associated with hallucinations is important for the effective assessment and treatment of individuals with psychosis. A clearer understanding may also contribute to the identification of those 'at risk' of developing symptoms of psychosis and therefore prevent the development of normal psychotic-like experiences to symptoms of psychosis. Consequently, the aim of the current study is to explore how auditory hallucinations are associated with events such as trauma and processes such as dissociation and schizotypy.

As the most common type of hallucinations reported (Ohayon, 2000), auditory hallucinations will be focused on in this study. Equally, to reflect the continuum model of psychosis, the research will be carried out across groups of healthy volunteers, individuals who experience anxiety and/or depression (emotional disorder) and individuals who experience psychosis with auditory hallucinations (psychotic disorder). Within each sample participants will be measured on trauma, dissociation, and schizotypy.

1.5.2. Research Question & Hypotheses

To explore how auditory hallucinations are associated with trauma, dissociation and schizotypy, the study used a quantitative research methodology to investigate the following research question and hypotheses:

Research Question

To what extent do trauma, dissociation and schizotypy have an effect on auditory hallucinations within groups of healthy volunteers (healthy volunteer group), individuals who experience anxiety and/or depression (emotional disorder group) and individuals who experience psychosis with auditory hallucinations (psychosis group)?

Hypotheses

1. There will be significant differences between individuals in the psychosis group, the emotional disorder group and the healthy volunteer group on measures of trauma, dissociation and schizotypy.
2. Trauma, dissociation and schizotypy will significantly correlate with, and predict, auditory hallucinations across the different groups.

Chapter 2: Methodology

2.1. Participants

Using a cross-sectional design, recruitment of participants involved three different samples:

i. Psychosis group: diagnosed with a psychotic disorder and experiences of auditory hallucinations (clinical sample)

ii. Emotional disorder group: diagnosed with clinical levels of anxiety/depression and/or receiving treatment for anxiety/depression (clinical sample)

iii. Health volunteer group: absence of mental health problems (past and present) (control sample)

In total, forty-four individuals subsequently participated in the study, and were assigned to one of the three groups on the basis of their experiences of psychosis, anxiety and/or depression, or absence of a mental health problem. 14 participants were recruited into the psychosis group, 15 into the emotional disorder group, and 15 into the healthy volunteer group. The mean age and gender for participants across the three groups are summarised below in Table 2.

Table 2. Sample Characteristics by Group

GROUP	n	Females	Males	Mean age
Psychosis Group	14	4	10	43.28
Emotional Disorder Group	15	11	4	35.8
Healthy Volunteer Group	15	10	5	37.13

Different recruitment procedures were used for the three samples, with participants in both the clinical samples (psychosis group and emotional disorder group) recruited from mental health services within the local National Health Service healthboard. Participants for the psychosis group were individuals who had a diagnosis of a psychotic disorder as defined by DSM-IV (e.g. schizophrenia, schizophreniform disorder, schizoaffective disorder) and were receiving treatment from either a specialist Adult Psychology Service or a locality-wide Severe & Enduring Mental Health Service. Participants for the emotional disorder group were individuals receiving treatment for anxiety and/or depression from an Adult Psychology Service, and were recruited via Clinical Psychologists within the service. Participants for the healthy volunteer group on the other-hand were recruited through poster adverts placed

around hospital settings and were an opportunity sample that included staff, students and visitors to the hospital, alongside acquaintances of the researcher. A more detailed description of the inclusion and exclusion criteria can be found in the appendices (see Appendix 2).

2.2. Procedure

Participants for both the clinical groups were invited to participate in the study by their clinician (i.e. Clinical Psychologist, Psychiatrist or Community Psychiatric Nurse). If they were interested in accepting this invitation they were given an information pack to read about the study in their own time, which outlined details of the study. Interested patients were then asked to send their contact details to the researcher in the provided stamped addressed envelope, which enabled the researcher to contact the individual to arrange a one-off appointment. Similarly, the healthy volunteers who responded to the poster adverts were given an information pack to read and asked to send their contact details to the researcher in the provided stamped addressed envelope if they wished to participate. This then enabled the researcher to contact the individual to arrange a one-off appointment.

Those individuals who agreed to participate in the research were requested to partake in a 30-45 minute assessment session with the researcher at their local Psychology Department or Health Centre at a time that was most convenient for them to attend (for the clinical groups, this was usually after their out-patient Psychology appointment). During the one-off appointment, inclusion and exclusion criteria were assessed, confidentiality discussed and participant's rights to withdraw at any time were outlined. Once the participants had confirmed they wished to proceed with the research, the assessment measures were administered in the order presented below, and instructions for the separate measures were explained individually. Participants were then encouraged to take their time to complete the measures and to ask the researcher any questions they had about the task.

Throughout the process of assessment, the researcher endeavoured to put the participants at ease and answer any relevant questions. On completion of the measures there was also an opportunity for participants to discuss any concerns or queries they had that may have arisen from undertaking the research. Following this time for discussion, participants were thanked for their contribution to the study.

2.3. Measures

The study used a self-report methodology to collect the relevant data, which involved using five self-report questionnaires and one semi-structured interview. All measures were selected

on the basis of their ability to measure the factors involved in this study, alongside their psychometric properties (e.g. reliability and validity) and previous use in similar studies. The selection of the measures was also influenced by practical factors such as the estimated time to complete the measures and ease with which the measures could be completed.

The choice of a self-report format was made to optimize accuracy of participant's responses, given that the assessor was unknown to most of the participants and the sensitive nature of some of the experiences being assessed, such as trauma history. Huppert, Smith and Apfeldorf (2002) evaluated the use of self-report measures in clinical out-patient populations and found high internal consistency for self-report measures in patients with schizophrenic disorders and anxiety disorders. They also reported that convergent validity of self-report measures correlated with interviewer ratings and concluded that reliable and valid information can be gathered with self-report measures in individuals with psychotic disorders (Huppert *et al.*, 2002). Consequently, evidence such as this supports the use of a self-report methodology in the current study.

The measures used in this study are listed below, in the order administered to participants, which is followed by a detailed description of each measure:

Screening Measure

1. Hospital Anxiety & Depression Scale (HADS: Zigmond & Snaith, 1983)

Predictor Measures

2. Rust Inventory of Schizotypal Cognitions (RISC: Rust, 1989)
3. Dissociative Experiences Scale (DES: Carlson & Putnam, 1993)
4. Trauma History Questionnaire (THQ: Green, Krupnick, Rowland, Epstein & Stockton, 1996)

Hallucinatory Measures

5. Revised Hallucinatory Scale (RHS: Morrison, Wells & Nothard, 2000)
6. Psychotic Symptom Rating Scale (PSYRATS: Haddock, McGarron, Tarrier & Faragher, 1999)

2.3.1. Description of Factor Measures

Emotional Distress

The Hospital Anxiety and Depression Scale (HADS: Zigmond & Snaith, 1983) is a self-report measure designed to identify the presence and severity of symptoms of anxiety and

depression. It was included in the study to measure general levels of emotional distress across the samples, and to ensure those referred to the emotional disorder group fulfilled the inclusion criteria of a score of eight or above on the HADS-Anxiety (HADS-A) or HADS-Depression (HADS-D) sub-scales. A cut-off score of 8 on either of the sub-scales has been reported as the most sensitive cut-off for identifying 'possible anxiety' and/or 'possible depression' (Zigmond & Snaith, 1983; Wilkinson & Barczak, 1988). However, a total of the two subscales can also be used to measure overall emotional distress, as was used in the current study.

Originally designed for use in medical out-patient populations, the HADS has been used extensively in research and clinical practice within psychiatric and medical patient populations, as well as the general population. Bjelland, Dahl, Haug & Neckelman (2002) carried out a meta-analysis of the literature on the validity of the HADS and using Cronbach's α they reported high reliability of the HADS-A and HADS-D subscales (estimated means of 0.83 and 0.82 respectively). They also reported a strong mean correlation between the two subscales ($r=0.56$). Based on these figures, Bjelland *et al.* (2002) concluded that the "HADS was found to perform well in assessing the symptom severity and caseness of anxiety disorders and depression in both somatic, psychiatric and primary care patients and in the general population" (pp.69).

In addition to Bjelland *et al.*'s (2002) report on the psychometric properties of the HADS, Crawford, Henry, Cormbie & Taylor (2001) reported the measure to have good reliability in a large non-clinical sample. Using Cronbach's α, Crawford *et al.* (2001) reported reliability for the HADS-A, HADS-D and HADS-Total as follows: 0.82, 0.77, 0.86, respectively. Similarly, Wilkinson & Barczak (1988) demonstrated its validity as a screening tool for anxiety and depression in general practice, whilst Upadhyaya & Stanley (1993) concluded from their evaluation of its use in primary care that the sub-scales provide a valid measure of the severity of mood disorders. Furthermore, it has been frequently used in research to measure psychopathology in samples of individuals with psychotic disorders (Chadwick, Lees & Birchwood, 2000; Chadwick, Williams & Mackenzie, 2002). Therefore, in view of its brevity, well-established psychometric properties and extensive use to measure psychopathology in samples of individuals with psychotic disorders, the HADS was chosen to measure depression and anxiety alongside overall emotional distress, within the current study.

Schizotypy

The Rust Inventory of Schizotypal Cognitions (RISC: Rust, 1989) is a measure for assessing a range of cognitions typically associated with schizotypal personality in the general population, such as paranoid, eccentric and idiosyncratic thinking. Such a measure of schizotypal cognitions is thought also to reflect an underlying information-processing style of weakened contextual integration associated with schizophrenia (Steel *et al.,* 2005). A key feature of the RISC that distinguishes it from other measures of schizotypy is that it focuses on schizotypal cognitions rather than cognitive deficit. It includes 26 items, half of which are reverse scored to eliminate response bias, with responses reported on a 4-point likert scale ('strongly agree', 'agree', 'disagree', 'strongly disagree'). Total scores are then defined into nine categories of severity ranging from 'Extremely Low'- 'Extremely High'. An example question is as follows:

	Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**
I have, on occasions, tried to reach the very essence of an object with my mind				

Psychometric properties of the scale have been well established (Balogh, Merritt & Steuerwald, 1991), with good test-retest reliability (α= 0.87) and split-half reliability (α= 0.71-0.83) (Rust, 1989). In terms of validity, the RISC has also been demonstrated to correlate significantly with the Psychoticism subscale ($r=-0.12$, $p<0.001$), Neuroticism subscale ($r=0.38$, $p<0.001$) and Lie subscale ($r=-0.19$, $p<0.001$) of the Eysenck Personality Questionnaire (Rust, 1989).

In view of its well established psychometric properties to measure schizotypal personality in the general population, the RISC has been used in clinical research and practice. For example, it has been used to investigate the correlation between dissociation and schizotypal cognitions in a student population (Bauer & Power, 1995), and to investigate correlates of hallucinations and delusions in sub-clinical populations (Altman, Collins & Mundy, 1997). Consequently, it is for these reasons, alongside its brevity in administration, that the RISC was selected in this study to measure schizotypy, and its associated style of information-processing.

Dissociation

The Dissociative Experiences Scale (DES: Carlson & Putnam, 1993) is a 28 item self-report scale used to measure dissociation and identify those who may be severely dissociative. The measure consists of three subscales (amnesia, depersonalisation-derealisation and absorption) with questions that assess a variety of normal dissociative experiences and more severe

disturbances such as impaired memory, identity and cognitions associated with dissociation. Subjects are required to indicate on a scale of 0-100% how often the different experiences happen to them ('never'-'always') and a total score is derived from the mean percentage of the 28 items. For example:

1. Some people have the experience of driving a car and suddenly realizing that they don't remember what has happened during all or part of the trip. Circle a number to show what percentage of the time this happens to you.										
0% (never)	10	20	30	40	50	60	70	80	90	100% (always)

The authors emphasise that the DES is a screening tool, rather than a "definitive tool for diagnosing patients" (Carlson & Putnam, 1993: pp.120). Consequently, it has been used extensively in clinical and research settings to screen for dissociation, and has been shown to have good overall psychometric properties (e.g. Ijzendoorn & Schuengel, 1996; Dubester & Braun, 1995). Dubester & Braun (1995) reported the DES to have good test-retest reliability (subscale scores α=0.78 and total scores α=0.96) and high internal consistency (subscale scores α= 0.96 and total scores α= 0.97), as well as good construct validity ($p<0.001$). Furthermore, as Table 1 (in Chapter 1) demonstrates, it has been used in numerous studies to measure the correlation between dissociation and factors associated with psychosis (Moskowitz *et al.*, 2005).

Factor analysis carried out on the DES has suggested that the scale measures three distinct dimensions of dissociation: amnestic dissociation, absorption/imaginative involvement, and depresonalisation/derealisation (i.e. Carlson *et al.*, 1991). For the purpose of the current study, scoring of the subscales was guided by the outcome of Carlson *et al.*'s (1991) factor analyses that is summarised in Table 3.

Table 3. DES Subscales (Carlson *et al.*, 1991)

Subscale	**Items**
Amnestic Dissociation	3,4,5,6,8,10,25,26
Absorption and Imaginative Involvement	2,14,15,16,17,18,20,22,23
Depersonalization and Derealization	7,11,12,13,27,28

Given the well-established psychometric properties of the scale and its extensive use in assessing the relationship between dissociation and psychosis, the DES was chosen in the current study to explore the relationship between dissociation and psychotic symptoms.

Trauma

The Trauma History Questionnaire (THQ: Green, Krupnick, Rowland, Epstein, & Stockton, 1996) is a self-report assessment of exposure to traumatic events across the life-span that meets the A1 criteria for DSM-IV diagnosis of Post Traumatic Stress Disorder (APA, 2000):

> A. The person has been exposed to a traumatic event in which
> (1) The person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others.

Designed for both general and clinical populations, the 24 items of the THQ cover three separate categories of trauma (crime-related events, general disaster and trauma, and unwanted physical and sexual experiences). The questionnaire requires respondents to indicate whether they have experienced any specific events under these categories, and if so, how many times the event was experienced and at what age. There is also the opportunity for further details to be recorded about the individual events, thereby assessing the nature as well as the presence of different traumatic experiences. As such, the authors believed it to be a comprehensive tool for assessing potentially traumatic events whilst not being overly intrusive.

An example of a question from the Trauma History Questionnaire is as follows:

	Crime Related Events	No/Yes (please circle)	If Yes No of Times/ Approx. Age
1	**Has anyone ever tried to take something directly from you by using force or the threat of force, such as a stick-up or mugging?**	No/Yes	

Data from the assessment can be scored in different ways depending on the nature of the information required, although the authors report that the most common method of scoring is to calculate the sum of different types of trauma exposure. Other methods can include calculating the number of types of interpersonal trauma (i.e. unwanted physical or sexual experiences) and the number of times a specific type of trauma has occurred (i.e. the number

of times a person has had unwanted physical experiences). In a recent study carried out by Morrison *et al.* (2005) the THQ was used to investigate the relationship between trauma and psychosis, and the authors defined trauma history as the number of different types of trauma to which participants were exposed over the life-time.

The lack of a standard method for scoring the THQ seems to have limited the collection of data regarding the instrument's psychometric properties. However, in a test-retest pilot study, the authors of the THQ concluded that the reporting of events over a three-month time span was consistent (r=0.60-1) (Green *et al.*, 1996). From student and clinical samples, they also observed that the data collected using the THQ correlates strongly with self-reported levels of distress. Consequently, the THQ was chosen for this study to fully assess a range of experiences of trauma across the life-span, whilst maintaining a self-report style of assessment. Based on the method of scoring used by Morrison *et al.* (2005) the number of different types of events endorsed by participants was chosen as the primary measure of trauma (rather than the frequency of individual traumatic events or the age at which traumas were experienced).

However, the absence of a dimension for assessing emotional forms of abuse in the THQ was noted and for the current study was supplemented with 5 selected items relating to emotional abuse from the Childhood Questionnaire (CTQ: Bernstein & Fink, 1998), which has demonstrated psychometric qualities (Bernstein *et al.,* 2003). Solely for the purpose of managing the data collected and reporting results from this subscale, the emotional abuse items were incorporated as a subscale of the THQ.

An example of the supplementary questions is as follows:

	No/Yes	If Yes No of Times/ Approx. Age
I believe that I was emotionally abused	No/Yes	

2.3.2. Description of Hallucinatory Measures

From the literature it appears that two main approaches have been used to measure the phenomenon of hallucinations. Traditionally, research has evaluated the occurrence and severity of symptoms of psychosis in individuals, by means of a structured clinical interview, such as the Positive and Negative Symptoms Rating Scale (Kay & Opler, 1987) (i.e. Kilcommons & Morrison, 2005) or the Psychotic Symptom Rating Scale (Haddock *et al.,* 1999) (i.e. Steel, Garety & Freeman *et al.*, 2007). However, predisposition to symptoms of

psychosis has also been measured in non-clinical populations, which enables an exploration of factors that may underlie psychotic-like symptoms and that may contribute to the development of psychosis. The Launay Slade Hallucination Scale (Launay & Slade, 1981) and its revised version, the Revised Hallucinatory Scale (Morrison, Wells & Nothard, 2000) are two scales which have facilitated the measurement of predisposition to both visual and auditory hallucinations in samples of individuals without psychosis. Given that both approaches to the measurement of hallucinations are valuable in the assessment of auditory hallucinations in clinical and non-clinical samples, predisposition to, and severity of, auditory hallucinations will be measured in the current study, using the following two scales:

Predisposition to Hallucinations

The Revised Hallucinatory Scale (RHS: Morrison, Wells & Nothard, 2000) is an adaptation of the Launay Slade Hallucination Scale (Launay & Slade, 1981), which measures individual's predisposition to hallucinations (auditory and visual). It is designed for clinical and non-clinical populations and measures the frequency of experiences related to hallucinations on a 4-point likert scale. It includes three subscales, derived from factor analysis, assessing vividness of imagination and daydreaming, predisposition to visual hallucinations, and predisposition to auditory hallucinations.

An example of a typical question from the scale is as follows:

		Never (1)	Sometimes (2)	Often (3)	Almost Always (4)
1.	**I daydream about being someone else**	**Never**	Sometimes	Often	Almost Always

From an initial exploration of the psychometric properties for the RHS, Morrison, Wells & Nothard (2002) reported the measure to have moderately stable test-retest reliability across 6 weeks (Cronbach's α=0.75) and good predictive validity (as measured from correlation analyses between the subscales of the RHS and Interpretations of Voices Inventory). More specifically, correlational analyses revealed significant correlations between the three identified subscales of the RHS and the Peters Delusions Inventory, which the authors interpreted as demonstrating validity of the individual subscales.

The authors carried out an analysis of the factor loading of subscale items for the RHS (Morrison, Wells & Nothard, 2002) and a breakdown of the subscale items used for scoring the RHS in this particular study is presented below in Table 4.

Table 4. RHS Subscales

Subscale	Items
Vivid imagery & daydreaming	1,2,3,4,5,6,11,12,15,16,17,23
Predisposition to visual hallucinations	10,14,18,19,20,22,24
Predisposition to auditory hallucinations	7,8,9,13,21

Given the recent development of the RHS, there is as yet limited psychometric data to support its use, although data for the Launay Slade Hallucinatory Scale indicates the original measure has good reliability (Cronbach's α =0.83) (Launay & Slade, 1981), which is supportive of the reliability of the RHS. Furthermore, several recent studies have employed the RHS to explore factors related to predisposition to hallucinations (i.e. Cangras *et al.* 2005; Morrison & Petersen, 2003) and it was therefore chosen for the current study to measure predisposition to auditory hallucinations in both clinical and non-clinical populations. More specifically, participants scores in the RHS Predisposition to Auditory Hallucinations subscale was of particular interest in the current study

Severity of Auditory Hallucinations

The Psychotic Symptom Rating Scale (PSYRATS: Haddock, McGarron, Tarrier & Faragher, 1999) is a 17 item measure of severity of auditory hallucinations and delusions, designed to capture the multidimensional nature of the experiences in psychotic patients. The measure consists of two scales, one for auditory hallucinations (11 items) and one for delusions (6 items). It is administered as a semi-structured interview, with each item rated on a 5-point likert scale (ranging from 'not endorse item' to 'fully endorse item') to assess the presence of either auditory hallucinations or delusions over the previous week and associated distress and disruption from the experiences. Therefore, it is almost a unique measure of auditory hallucinations in its assessment of symptom-related distress. An example question from the PSYRATS is as follows:

Frequency	How often do you experience voices? (every day, all day long etc)?
0	Voices not present or present less than once a week
1	Voices occur for at least once a week
2	Voices occur at least once a day
3	Voices occur at least once a hour
4	Voices occur continuously, almost continuously i.e. stop for only a few seconds/minutes

Haddock *et al.* (1999) report the PSYRATS to have good inter-rater reliability (α=0.78 for the 11 auditory hallucination items, and α=0.9 for 9 delusion items). Drake *et al.* (2007) supported Haddock *et al.'s* (1999) findings in their investigation of the reliability and validity

of the PSYRATS with results demonstrating good inter-rater reliability, test-retest reliability and concurrent validity. Given the scales strong psychometric properties, the authors also conclude that it offers a reliable method for measuring change over time. Therefore, in view of its extensive use in clinical practice and research, and its strong inter-rater reliability and validity, the auditory hallucination scale of the PSYRATS was chosen for the current study to examine various dimensions of auditory hallucinations and overall severity of auditory hallucinations.

2.4. Ethics

Ethics approval was granted from the local NHS Research & Ethics Committee to recruit participants from within the local NHS healthboard, whilst permission to carry out the research was also granted from the local NHS Research & Development Office. Prior to applying for consent from the Research & Ethics Committee, several ethical issues had to be considered which have been described below.

1. Participant Involvement:

To prevent clients from feeling obliged to consent to participation, individuals were given 24 hours or more to consider whether or not they wished to participate in the study. It was also emphasized to individuals that participation was voluntary and that they could withdraw from the study without giving a reason and that this would have no unfavourable consequences for them or their healthcare. In order to minimise performance anxiety, participants were reassured that the assessment was not a test, in which there were no right or wrong answers and that the information provided would remain confidential.

2. Accuracy of self-report data:

The accuracy of participants' self-report data was optimized by emphasizing participant confidentiality, establishing a rapport with individuals to ensure they felt at ease in the assessment setting, whilst also minimizing distractions during the assessment. Equally, individuals were encouraged to complete the self-report questionnaires independently and using the paper/pens provided, to minimize response-bias.

3. Participant specific difficulties:

Given the nature of the client groups involved in the study, it was expected that some participants might experience difficulties with attention and concentration. Consequently, the assessment took place on a one-to-one basis in a quiet setting with minimal distractions. The researcher also remained sensitive to cues given by the participant that may indicate

distractibility, fatigue or a lack of interest. At these times a brief break from the assessment process or rescheduling of the assessment was offered.

4. Distress:

It was anticipated that participants might become emotionally distressed by sensitive questions during the assessment. Consequently, if a participant had become distressed, various steps would have been taken to minimise distress:

a. The researcher would provide appropriate support and sensitivity and an opportunity for discussion

b. The participant would be asked if they would like to stop the assessment and offered the following:

i. To take a brief break

ii. To continue at another time or

iii. To withdraw from the study completely

c. Participants were encouraged to contact their GP or mental health worker should they find themselves distressed after the session.

Despite these planned arrangements, no participants became distressed over the course of the assessment, and all participants were encouraged by the researcher to contact their GP or mental health worker should they have become distressed following the session.

2.5. Power Analysis

In order to establish the number of participants required in each group, an a priori power analysis was carried out using Cohen's tables (Cohen, 1992). Although, this particular study had not been carried out before, previous research in the area suggests that a large effect size may exist between some of the factors measured (Moskowitz *et al.*, 2005) as reported in Chapter 1. Accordingly, for a between groups analysis (ANOVA) with an α level of 0.05 and power of 0.8, Cohen recommends that 21 participants would be required per group to detect a large effect size. Equally, for correlation analysis across the three groups, with an α level of 0.05 and power of 0.8, then Cohen (1992) recommends a sample of 28 participants to detect a large effect size. These calculations were used to guide recruitment, whilst recruitment was also influenced by restrictions in referrals to the study.

2.6. Statistical Data Analysis

Following the assessment process, data was managed and statistically analysed by means of analysis of variance (ANOVA), correlation analysis and multiple regression, using SPSS (Version 14.0).

Chapter 3: Results

3.1. Exploratory Analysis

All participants completed the assessment procedure described in Chapter 2 and the scores from the hallucinatory variables (the PSYRATS total and the RHS total and subscale) were checked for assumptions of normal distribution and homogeneity of variance.

In the assessment of distribution of scores on the hallucinatory variables, the conversion of skewness and kurtosis scores to z-scores for each group illustrated that all values were below the upper limit of 2.58 and therefore non-significant as recommended for small samples (Field, 2005). The Kolmogorov-Smirnov test was also carried out to test assumptions of normally distributed data, which indicated a significant deviation from normality on the distribution of the PSYRATS total scores in the psychosis group ($D(14)=0.26$, $p=0.01$). Significant deviation from normality was also measured for the three groups on the RHS Predisposition to Auditory Hallucinations subscale: $D(14)=0.23$, $p<0.05$ for the psychosis group; $D(15)=0.23$, $p<0.05$ for the emotional disorder group; and $D(15)=0.47$, $p<0.01$) for the healthy volunteer group.

Levene's Homogeneity of Variance test revealed significant differences in variance for both the RHS total scores, $F(2,40)=4.33$, $p<0.05$, and the RHS Predisposition to Auditory Hallucinations subscale scores, $F(2,40)=8.76$, $p<0.01$, which indicated heterogeneity of variance. However, for log transformed scores no significant differences of variance were indicated for the RHS total scores, $F(2,40)=2.09$, $p>0.05$, whilst significant differences were indicated for the RHS Predisposition to Auditory Hallucinations subscale scores, $F(2,40)=3.95$, $p<0.05$.

Given the robustness of ANOVA to violations of its parametric assumptions (Field, 2005), one-way ANOVAs were carried out and reported to measure between group differences within this study. Nevertheless, the variances reported above were taken into account by carrying out the non-parametric Kruskal-Wallis test. This test revealed significant differences between groups for all the hallucinatory variables ($H(2)= 40.99$, $p<0.001$ for the PSYRATS; $H(2)=22.50$, $p<0.001$ for the RHS total; and $H(2)=29.17$, $p<0.001$ for the RHS predisposition to auditory hallucinations subscale), therefore suggesting that the previously reported between group differences on the hallucinatory variables could not be attributed to the groups deviation from normal distribution.

3.1.1. Sample Characteristics

As presented in Table 2 (in Chapter 2), gender distribution differed across the three groups. There were more males than females in the psychosis group, whilst in the emotional disorder group and the healthy volunteer group there were more females than males. A chi square test revealed a significant difference in gender ratio between the three groups, $\chi^2(2)=681$, $p<0.05$. The effect of gender on scores was also considered using independent samples t-tests to identify whether there was a significant effect of gender on the mean scores of each variable. Significant differences were found on the PSYRATS ($t=2.17$, $df=42$, $p<0.05$, $r=.26$), with males scoring statistically higher (Mean=16.37, SE=4.02) than females (Mean=6, SE=2.81). Therefore, gender was controlled for in further analyses of this specific variable using analysis of covariance (ANCOVA) to eliminate the identified confounding effect of gender. Similarly, significant differences in gender distribution were found on the THQ Sexual Experiences subscale ($t=2.10$, $df=42$, $p<0.05$, $r=.31$), with females scoring statistically significantly higher (Mean=0.68; SE= 0.2) than males (Mean=0.15; SE=0.11) on this type of trauma. Given that all subsequent analyses were carried out on the THQ Sum of Unwanted Physical and Sexual Experiences subscales combined (as indicated by the authors of the THQ (Green et al., 1996)), gender was also controlled for in further analyses of this variable, again using ANCOVA. This enabled a more accurate measurement of group differences on these variables, independent of the effect of gender.

3.2. Comparison of Groups for the Hallucinatory and Predictor Variables

In view of the first hypothesis, proposing that there will be significant differences between individuals in the psychosis group, the emotional disorder group and the healthy volunteer group on measures of trauma, dissociation and schizotypy, between group differences were explored on the scores of the measured variables. This was carried out by comparing mean scores for each group on the hallucinatory variables and the predictor variables and by performing one-way ANOVAs to determine whether between group differences were significant. Wherever significant between group differences were indicated from the results of the ANOVA, Scheffe's post hoc analysis was selected on the basis of its conservative nature, to identify where the main effect lay on the mean scores of the variables. Any values significant at $p<0.05$ or better are reported below, whilst non-significant results have not been reported, unless close to the level of significance. However, it is important to acknowledge the conservative nature of the Scheffe test and the associated risk of a Type II error (Field 2005), particularly in view of the study's restricted sample size.

The mean scores on the hallucinatory variables for each group are presented below in Table 5, followed by the results of the between groups analysis. Subsequently, the mean scores of the predictor variables for each group are presented in Table 6, followed by the results of the between groups analysis.

3.2.1. Hallucinatory Variables

Table 5. Mean scores on hallucinatory measures for each group

Hallucinatory Variables	Psychosis Group Mean (SD)	Emotional Disorder Group Mean (SD)	Healthy Volunteer Group Mean (SD)
Psychotic Symptom Rating Scale	**32.92 (9.18)**	**0**	**0**
Revised Hallucinatory Scale	**47.78 (12.37)**	**35.40 (9.27)**	**28.13 (3.74)**
Predisposition to Auditory Hallucination subscale	2.11 (0.51)	1.27 (0.29)	1.05 (0.12)

Severity

The Psychotic Symptom Rating Scale (PSYRATS) was administered to measure severity of auditory hallucinations, and the results indicated that auditory hallucinations were only reported in the psychosis group. Participants in the emotional disorder group and healthy volunteer group reported no auditory hallucinations, and the differences between groups on the mean PSYRATS total scores were further explored using a one-way ANOVA. This indicated the between group differences on the PSYRATS to be significant, $F(2,41)=193.42$, $p<0.01$, $r=.95$. Equally, a one-way ANOVA was carried out on this variable with the effect of gender controlled for, and the between group differences were still found to be significant ($F(2,40)=174.03$, $p<0.01$, $r=.86$). Post-hoc analysis (using Scheffe's test) indicated that in terms of severity of auditory hallucinations significant mean differences existed between the psychosis group and emotional disorder group (Mean=32.92, SE=1.92), and between the psychosis group and healthy volunteer group (Mean=32.92, SE=1.92).

Predisposition

RHS total

In terms of predisposition to hallucinations in general, as measured by the total score of the Revised Hallucinatory Scale (RHS), the psychosis group reported the greatest predisposition to hallucinations and the healthy volunteer group the least, with the emotional disorder group reporting more than the healthy volunteer group. Given these differences, a one-way ANOVA was carried out which indicated a significant difference between groups on the total score of

the RHS, $F(2,41)=17.24$, $p<0.01$, $r=.68$. Post-hoc analysis (using Scheffe's test) of the between group differences on the mean total score of the RHS revealed significant mean differences between the psychosis group and emotional disorder group (Mean=12.38, SE=3.37), and between the psychosis group and the healthy volunteer group (Mean=19.65, SE=3.37). Consequently, the means scores on the RHS for the psychosis group were significantly different from the emotional disorder group and the healthy volunteer group.

RHS Predisposition to Auditory Hallucinations subscale

Given that the RHS Predisposition to Auditory Hallucinations subscale is of particular interest in this study, it is worthwhile to note that the mean average score on this subscale was greatest for the psychosis group, less for the emotional disorder group, and the least for the healthy volunteer group. These group differences were further explored using a one-way ANOVA which indicated significant differences between groups on the RHS Predisposition to Auditory Hallucinations subscale: $F(2,41)=38.68$, $p<0.01$, $r=.81$. Post hoc analysis (using Scheffe's test) indicated a significant mean difference between the psychosis group and emotional disorder group (Mean=0.85, SE=0.13), and between the psychosis group and the healthy volunteer group (Mean=1.06, SE=0.13). Consequently, for this subscale of the RHS, the mean scores for the psychosis group were significantly different from the emotional disorder group and the healthy volunteer group (as for the RHS total scores).

Therefore, the results of the between group comparisons on the hallucinatory variables indicated differences between the three groups on severity of auditory hallucinations, predisposition to hallucinations in general, and predisposition to auditory hallucinations in particular.

3.2.2. Predictor Variables

The mean scores for each group on the measures of trauma, dissociation and schizotypy are presented in Table 6.

Table 6. Mean scores on factor measures for each group

Predictor Variables	Psychosis Group Mean (SD)	Emotional Disorder Group Mean (SD)	Healthy Volunteer Group Mean (SD)
THQ- Sum of all events	**8.14 (5.81)**	**8.13 (3.44)**	**4.27 (3.34)**
Sum of crime related trauma	1.07	1.07	1.2
Sum of general disasters	3.42	3.13	1.87
Sum of unwanted physical & sexual experiences	1.21	1.60	0.2
Sum of emotional abuse	2.14	1.80	0.77
DES	**675 (600)**	**610 (543.17)**	**168 (163.4)**
Amnestic Dissociation Subscale	116.43	108.67	26
Absorption & Imaginative Involvement Subscale	279.28	282	74
Depersonalisation & Derealisation Subscale	142.86	71.33	9.33
RISC	**39.43 (12.02)**	**30.80 (12.39)**	**21.13 (9.03)**
HADS	**22.64 (4.41)**	**18.67 (7.17)**	**6.27 (3.26)**

Trauma

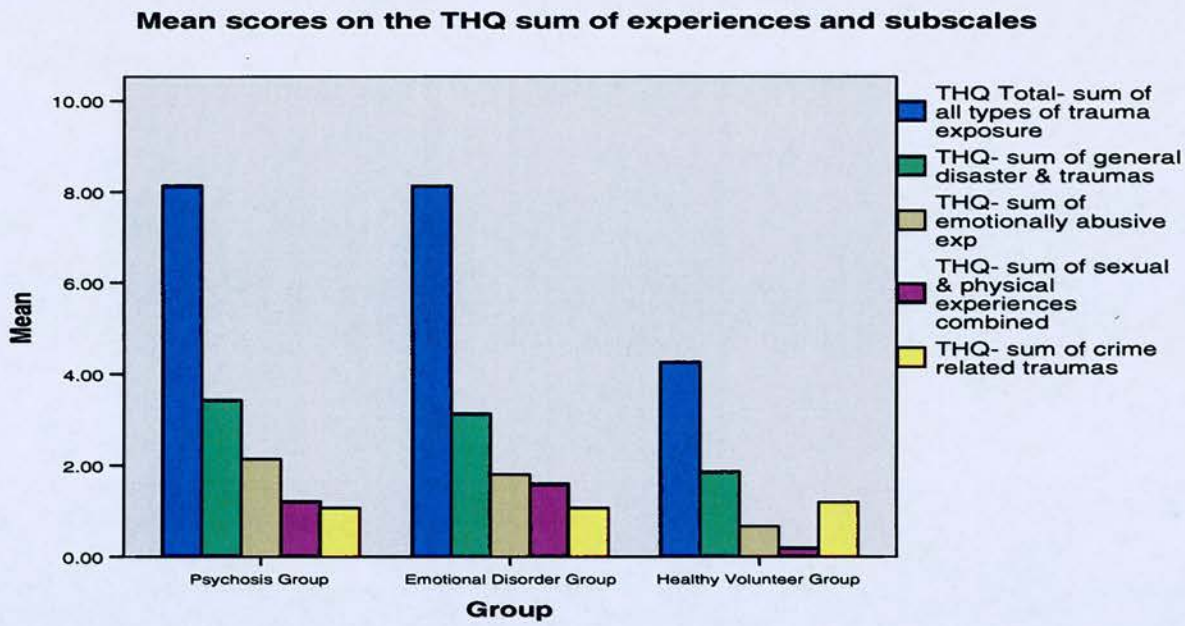
Within this study, the Trauma History Questionnaire (THQ) was administered as a measure of trauma exposure, with the total score reflecting the total number of different types of trauma reported. The THQ subscale scores were also used to measure exposure to specific types of trauma. Figure 3 presents the mean scores for the THQ total and subscales for each group.

THQ Total- sum of all types of trauma

The results show that in terms of overall trauma, the two clinical groups reported a similar mean number of overall trauma events, although there were differences between these two groups on the specific types of traumas experienced. Furthermore, the overall number of different trauma events experienced by the two clinical groups was greater than that of the healthy volunteer group. To explore these differences further, a one-way ANOVA carried out on the mean of the THQ total score for each group revealed significant between group

differences, F(2,41)= 3.98, p<0.05, r=.40. Using Scheffe's test to identify where the main effect lay, post-hoc analysis indicated that there were no significant differences between groups at the significance level of p=0.05. However, the difference of mean scores between the psychosis group and the healthy volunteer group was close to this significance level (p=0.06), as was the difference between the emotional disorder group and the healthy volunteer group (p=0.06).

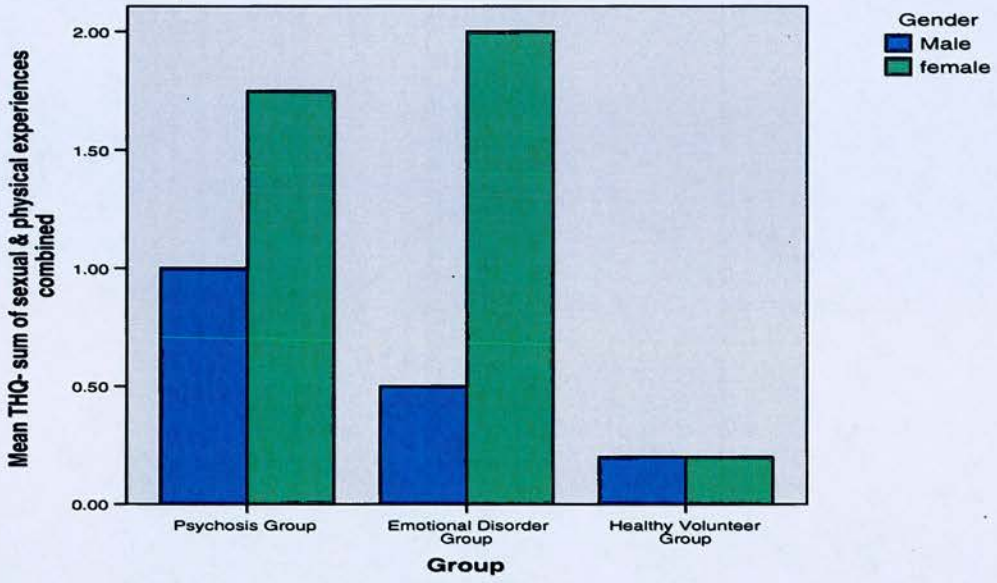
Figure 3. Mean of the THQ Sum of All Events and subscales for each group.



THQ Subscales

From the mean scores on the THQ subscales, as presented in Table 6, between group differences were indicated and further assessed by carrying out a one-way ANOVA on the THQ subscales. This indicated that there was no significant difference between groups for specific types of trauma experienced, other than for the THQ Unwanted Physical and Sexual Experiences subscale, F(2,41)= 4.31, p<0.05, r=.42. However, given that an effect of gender had been indicated on the mean scores of the THQ Sexual Experiences subscale, a one-way ANOVA was also carried out on the combined THQ Unwanted Physical and Sexual Experiences subscale, which controlled for the effect of gender, F(2,40)=4.88, p<0.01, r=.52. This indicated that with gender controlled for, there was a highly significant difference between groups on this variable. The differences in mean scores reported by males and females on this variable are demonstrated in Figure 4 below and present an interesting finding.

Figure 4. Mean scores for males and females in each group on the THQ Sum of Unwanted Sexual and Physical Experiences

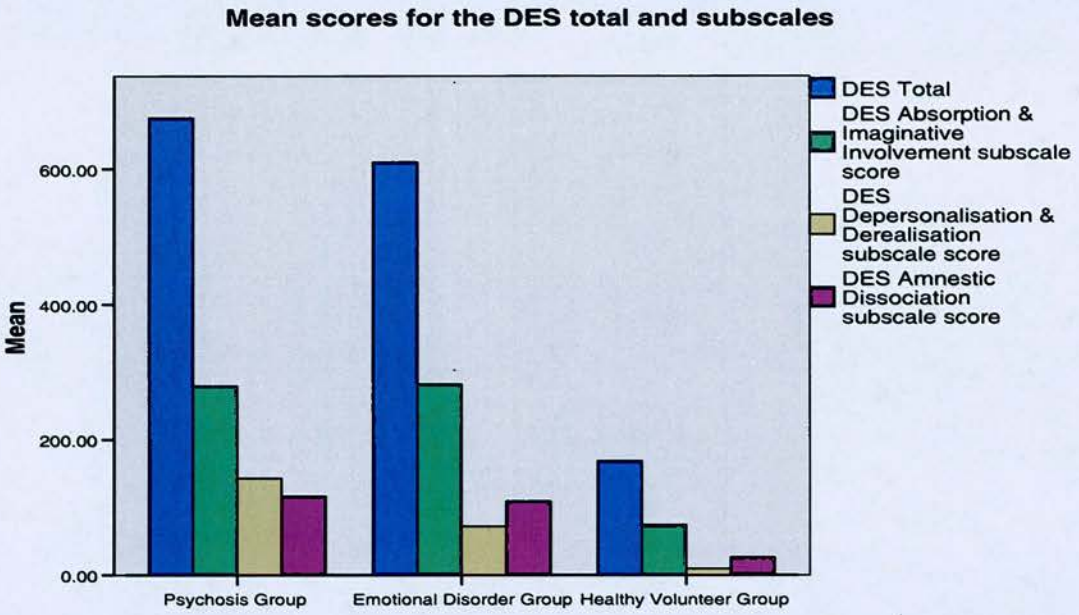


Post hoc analysis (using Scheffe's test) of the between group differences on the THQ Unwanted Physical and Sexual Experiences subscale indicated a significant difference between the emotional disorder group and healthy volunteer group on the THQ Unwanted Physical and Sexual Experiences subscale, (Mean=1.4, SE=0.49). Given that between group differences had also been predicted for other types of trauma, the non-significant association between group differences on the THQ General Disaster subscale (p=0.07) was further explored using Scheffe's Test. This post hoc analysis revealed no significant differences.

Dissociation

The Dissociative Experiences Scale (DES) was used to measure dissociation, and between group differences were analysed on the mean of the DES total scores and the three subscale scores (presented below in Figure 5).

Figure 5. Mean of the DES total scores and the three subscale scores for each group.



DES Total

Overall levels of dissociation were greatest in the psychosis group and least in the healthy volunteer group, with the emotional disorder group reporting slightly less dissociation than the psychosis group. However, the mean scores of the subcomponents of dissociation show a different pattern between the groups to that of the overall levels of dissociation. A one-way ANOVA indicated these between group differences on the total score of the DES to be significant, $F(2,41)= 5.01$, $p<0.05$, $r=.44$. Furthermore, post hoc analysis indicated significant differences between the mean scores of the psychosis group and the healthy volunteer group (Mcan=5.07, SE=176.00), and between the emotional disorder group and the healthy volunteer group (Mean=442, SE=172.94).

DES Subscales

As illustrated in Figure 5, between group differences were found on the mean scores of the DES subscales. From one-way ANOVAs, significant between group differences were found

on the DES Absorption & Imaginative Involvement subscale ($F(2,41)=6.56$, $p<0.05$, $r=.49$) and the DES Depersonalisation & Derealisation subscale, ($F(2,41)=10.17$, $p<0.01$, $r=.58$). To identify where the significant main effect lay, post hoc analysis indicated several significant differences on the mean scores of the DES subscales. On the DES Absorption & Imaginative Involvement subscale, significant differences were found between the psychosis group and the healthy volunteer group (Mean=205.28, SE=66.69), and between the emotional disorder and the healthy volunteer group (Mean=208, SE=65.53). On the DES Depersonalisation & Derealisation subscale, significant differences were measured between the psychosis group and healthy volunteer group (Mean=133.52, SE=29.61). Similarly, differences between the psychosis group and emotional disorder group were close to significance ($p=0.06$).

Schizotypy

The total score of the Rust Inventory of Schizotypal Cognitions (RISC) was used in the current study as a measure of schizotypal cognitions. The mean total scores for each group indicated that the psychosis group had the greatest levels of schizotypal cognitions, with the emotional disorder group reporting less than the psychosis group and the healthy volunteer group reporting the least. A one-way ANOVA indicated these between group differences to be significantly different, $F(2,41)= 9.64$, $p<0.01$, $r=.56$. Therefore, post hoc analysis carried out indicated significant differences between the mean scores of the psychosis group and the healthy volunteer group (Mean=18.29, SE=4.17). No other significant between group differences were indicated for this measure at the significance level of $p=0.05$, however, the difference between the emotional disorder group and the healthy volunteer group was close to the $p=0.05$ significance level ($p=0.07$). Therefore, significant differences on the RISC were indicated between the psychosis group and the healthy volunteer group.

3.2.3. Summary of Group Comparisons

The results reported above for the predictor variables indicate between group differences on the measures of trauma, dissociation and schizotypal cognitions, however, contrary to prediction, fewer differences between the psychosis group and the emotional disorder group were indicated on the mean scores of the predictor variables. In terms of trauma measured by the THQ, no significant differences were indicated between the two clinical groups for overall levels of trauma and individual types of trauma. However, the levels of overall trauma and specific types of trauma in the clinical groups were significantly greater than those levels reported in the healthy volunteer group. In terms of dissociation both the clinical groups reported significantly greater levels of overall dissociation than the healthy volunteer group, although no significant difference was found between the two clinical groups for overall

levels of dissociation. On the subcomponents of dissociation, significant differences between the psychosis group and emotional disorder group were found on the depersonalisation and derealisation subcomponent of dissociation. However, on the other dissociation subscales the clinical groups reported similar levels of dissociative symptomatology, which was significantly greater than the healthy volunteer group. Finally, in terms of schizotypal cognitions, significant differences were found between each group as predicted, with the psychosis group reporting significantly more severe levels of schizotypal cognitions than the emotional disorder group, and the emotional disorder group reported more severe levels of schizotypal cognitions than the healthy volunteer group.

3.3. Associations

In order to explore the hypothesis that trauma, dissociation and schizotypy will have a significant correlation with auditory hallucinations across the different groups, the relationships between the predictor variables and the hallucinatory variables were analysed using Pearson's Correlation (two-tailed). The results were also compared with the correlations reported from a partial correlation analysis that controlled for gender, however this comparison indicated no difference in the level of significance of correlations in each case. Details of the correlations have been reported in Table 7 and a summary of the significant findings is presented below.

3.3.1. Association of Predictor Variables with the PSYRATS

In terms of severity of auditory hallucinations, positive relationships were found between the PSYRATS total and the DES total, with a moderate effect size ($r=0.38$; $p<0.01$), and between the PSYRATS total and the RISC total, with a large effect size ($r=0.51$; $p<0.001$). However, no such significant effect was found between the PSYRATS total and the THQ total, which is different from predictions. These correlations, suggest a strong association between severity of auditory hallucinations and schizotypal cognitions, and a moderate association between severity of auditory hallucinations and overall levels of dissociation.

To understand more fully the nature of the relationship between severity of auditory hallucinations and trauma, dissociation and schizotypy, it was also of interest to consider the subscales of these measures. Significant positive associations were found between the PSYRATS total and the THQ Emotional Abuse subscale ($r=0.31$; $p<0.05$), and between the

Table 7. Correlations found between the hallucinatory variables and the predictor variables (for the total sample)

Variable	**THQ Total**	THQ Crime Related	THQ General Disaster	THQ Sexual/Phys Experience.	THQ Emotional Abuse	**DES Total**	DES Amnestic Dissociation	DES Absorp./Imag. Involvement	DES Deperson./ Derealisation	**RISC Total**
Severity of AH (PSYRATS Total)	0.24	-0.03	0.22	0.16	0.31*	0.38**	0.27	0.36**	0.71**	0.51**
Predisposition to Hallucinations (RHS Total)	0.68**	0.58**	0.45**	0.53**	0.64**	0.71**	0.62**	0.67**	0.78**	0.80**
Predisposition to AH (RHS Subscale)	0.53**	0.18	0.39**	0.4**	0.5**	0.56**	0.47**	0.51**	0.72**	0.67**

*p<0.05, **p<0.01

Table 8. Correlations found between the predictor variables (for the total sample)

Variable	**THQ Total**	**DES Total**	**RISC Total**
THQ Total	-	**0.49****	**0.65****
DES Total	**0.49****	-	**0.64****
RISC Total	**0.65****	**0.64****	-

*p<0.05, **p<0.01

PSYRATS total and DES Absorption & Imaginative Involvement subscale ($r=0.36$; $p<0.01$) and between the PSYRATS and the DES Depersonalisation & Derealisation subscale ($r=0.71$; $p<0.001$). This indicates significant positive relationships between severity of auditory hallucinations and trauma related to emotional abuse, and dissociation related to both absorption and imaginative involvement, and depersonalisation and derealisation, and schizotypal cognitions.

3.3.2. Association of Predictor Variables with RHS total score

In terms of predisposition to hallucinations in general (i.e. not predisposition to auditory hallucinations in particular), significant positive correlations were also indicated between the mean scores of the RHS total and the mean scores of the predictor variables. Large effect sizes were measured between the RHS total and the THQ total ($r=0.68$; $p<0.001$), the DES total ($r=0.71$; $p<0.001$) and the RISC total ($r=0.80$; $p<0.001$). This indicates that the THQ, DES and RISC had strong associations with the RHS total score.

In terms of the subscales of the THQ, significant positive correlations were indicated between the RHS total and the THQ General Disaster's subscale ($r=0.45$; $p<0.001$), the THQ Unwanted Sexual & Physical Experiences subscale ($r=0.53$; $p<0.001$) and the THQ Emotional Abuse subscale ($r=0.64$; $p<0.001$). Significant positive correlations were also measured between the RHS total and the subscales of the DES. For example, a large effect size was found between the RHS total and the DES Amnestic Dissociation subscale ($r=0.62$, $p<0.001$), the DES Absorption and Imaginative Involvement subscale ($r=0.67$; $p<0.001$), and the DES Depersonalisation & Derealisation subscale ($r=0.78$; $p<0.001$). This indicates that for this hallucinatory variable, there were moderate to strong positive associations between three of the THQ subscales (General Disaster, Unwanted Sexual & Physical Experiences, and Emotional Abuse), and the three DES subscales.

3.3.3. Association of Predictor Variables with RHS Predisposition to Auditory Hallucinations subscale

For predisposition to auditory hallucinations, large effect sizes were indicated between the RHS Predisposition to Auditory Hallucinations subscale and the THQ total ($r=0.53$; $p<0.001$), the DES total ($r=0.56$; $p<0.001$), and the RISC total ($r=0.67$; $p<0.001$). This indicates that the THQ, DES and RISC had strong positive associations with the RHS Predisposition to Auditory Hallucinations subscale.

In terms of the subscales of the THQ, significant positive associations were indicated between the RHS Predisposition to Auditory Hallucinations subscale and the THQ General Disaster's subscale ($r=0.39$; $p<0.01$), the THQ Unwanted Sexual & Physical Experiences subscale ($r=0.40$; $p<0.01$), and the THQ Emotional Abuse subscale ($r=0.50$; $p<0.01$). Similarly, for the subscales of the DES, significant positive correlations were found between the RHS Predisposition to Auditory Hallucinations subscale and the DES Amnestic Dissociation subscale ($r=0.47$; $p<0.001$), the Absorption & Imaginative Involvement subscale ($r=0.51$; $p<0.001$), and the Depersonalisation & Derealisation subscale ($r=0.72$; $p<0.001$). These results indicate a moderate-strong positive association between the RHS Predisposition to Auditory Hallucinations subscale and these THQ subscales (General Disaster, Unwanted Sexual & Physical Experiences, and Emotional Abuse). Similarly strong positive associations were indicated between the RHS Predisposition to Auditory Hallucinations subscale and the DES subscales, with the strongest association being with the DES Depersonalisation & Derealisation subscale.

A diagrammatic summary of the correlations found between the predictor variables and the PSYRATS and RHS Predisposition to Auditory Hallucinations subscale, as reported above, can be found in Figure 6 and 7 (see Appendix 5).

3.3.4. Associations between the Predictor Variables

Correlation analysis was also carried out between the predictor variables to determine how strongly trauma, dissociation and schizotypy correlated with each other. The results presented in Table 8 indicate significant positive correlations between the variables, with the strongest association between the THQ total and the RISC total ($r=0.65$, $p<0.001$), and between the DES total and the RISC ($r=0.64$, $p<0.001$).

3.4. Variables Predicting Hallucinations

In order to explore the third and final hypothesis that trauma, dissociation and schizotypy will predict auditory hallucinations across the different groups, standard multiple regression analyses were carried out to identify which of the predictor variables best predicted severity of, and predisposition to, auditory hallucinations. This was carried out on an exploratory basis, given the study's small sample size and the associated limitations of insufficient statistical power. With these important limitations in mind, it was intended to only interpret

the results of the multiple regression analysis with caution, and form any conclusions tentatively.

The selection of predictor variables was guided by previous theoretical models of hallucinations and the findings from the correlation analysis presented above, and included the THQ Emotional Abuse subscale, the DES Depersonalisation and Derealisation subscale, and the RISC total score. Therefore, the PSYRATS and RHS Auditory Hallucinations subscale scores were entered as the predicted variables in separate analyses, and the THQ (Emotional Abuse subscale), RISC (Total), and DES (Depersonalisation and Derealisation subscale) were entered as the predictor variables for both analyses. The results of the analyses have been summarised below in Tables 9 and 10 (for the PSYRATS) and Table 11 and 12 (for the RHS Auditory Hallucinations Subscale).

Table 9 & 10. Multiple Regression with severity of auditory hallucinations as a predicted variable[1]

Predictor Variables	**R^2**	**adjusted R^2**	**Standardised Beta**	**t**	**p**
	0.42	**0.38**			
RISC (Total)			**0.22**	**1.29**	**.21**
DES (Depersonalisation & Derealisation)			**0.55**	**3.31**	**0.001**
THQ (Emotional Abuse)			**-0.12**	**-0.79**	**0.44**

Dependent Variable: PSYRATS Total Score

Final Model

Predictor Variables	**R^2**	**adjusted R^2**	**Standardised Beta**	**t**	**p**
	0.39	**0.38**			
DES (Depersonalisation & Derealisation)			**0.63**	**5.24**	**0.001**

Dependent Variable: PSYRATS Total Score

Tables 9 and 10 show the results of the standard multiple regression carried out with the PSYRATS as the predicted variable. Of the predictor variables, the DES Depersonalisation and Derealisation subscale was the only variable which contributed significantly to the prediction of severity of auditory hallucinations, $F(1,41)=27.44$; $p<0.001$. More specifically, the DES Depersonalisation and Derealisation subscale was found to account for 38% of the (adjusted) variance measured in severity of auditory hallucinations.

[1] N=44

Table 11 & 12. Multiple Regression with predisposition to auditory hallucinations as a predicted variable[2]

Predictor Variables	R^2	adjusted R^2	Standardised Beta	t	p
	0.76	**0.58**			
RISC (Total)			**0.32**	**2.24**	**0.03**
DES (Depersonalisation & Derealisation)			**0.48**	**3.38**	**0.001**
THQ (Emotional Abuse)			**0.04**	**0.35**	**0.73**

Dependent Variable: RHS Predisposition to Auditory Hallucinations subscale score

Final Model

Predictor Variables	R^2	adjusted R^2	Standardised Beta	t	p
	0.76	**0.58**			
RISC (Total)			**0.34**	**2.53**	**0.02**
DES (Depersonalisation & Derealisation)			**0.49**	**3.68**	**0.001**

Dependent Variable: RHS Predisposition to Auditory Hallucinations subscale score

Tables 11 and 12 show the results of the standard multiple regression carried out with the RHS Predisposition to Auditory Hallucinations subscale as the predicted variable. Of the predictor variables, the DES Depersonalisation and Derealisation subscale and the RISC (total) contributed significantly to the prediction of severity of auditory hallucinations, $F(2,41)=28.42$; $p<0.001$. More specifically, the DES Depersonalisation and Derealisation subscale and the RISC (total) combined were found to account for 58% of the (adjusted) variance in predisposition to auditory hallucinations.

Therefore, from these regression analyses, the DES Depersonalisation and Derealisation subscale was found to be the only variable to significantly predict severity of auditory hallucinations, whilst the DES Depersonalisation and Derealisation subscale and the RISC (total) combined were found to predict a significant amount of variance in the predisposition to auditory hallucinations.

[2] N=44

Chapter 4- Discussion

4.1. Summary of Findings

The present study aimed to explore how auditory hallucinations are associated with trauma, dissociation and schizotypy within clinical and non-clinical samples. To investigate these associations, two dimensions of auditory hallucinations were considered in particular (predisposition and severity) across groups of individuals with psychosis and auditory hallucinations, anxiety and/or depression, and healthy volunteers.

A number of interesting characteristics were observed from the findings and are worth consideration in the context of this discussion. First, the greater number of males than females in the psychosis group contrasts with the greater number of females than males in the emotional disorder group and the healthy volunteer group. It is possible to interpret the differences in gender distribution between the two clinical groups within the context of normal variances in gender reported across different psychiatric populations, as described previously (in Chapter 1) (Kessler et al., 1994). Consequently, it seems that the differences of gender in participants observed within the current study are reflective of those differences occurring in the general population.

The absence of auditory hallucinations reported amongst individuals with clinical levels of anxiety and/or depression and healthy volunteers contrasts with existing prevalence figures for hallucinations in the general population (Tien, 1991; Ohayon, 2000). Therefore the absence of auditory hallucinations reported in these samples may reflect participants' reluctance to discuss such experiences in a mental health setting or rather more the reluctance of individuals with such experiences, without a diagnosis of a psychotic disorder, to volunteer to participate in such a study. However, methodological problems of restricted sample size should also be considered, and had it been possible to recruit more participants into the non-psychosis groups, then the reports of auditory hallucinations in those samples may have been more representative of the estimated prevalence of auditory hallucinations in the general population.

Of further interest are the rates of trauma reported across the different samples (as measured by the THQ). Individuals with psychosis and auditory hallucinations reported the same number of different types of trauma as the individuals with clinical levels of anxiety and/or depression. This suggests that both clinical groups had similar degrees of trauma exposure, whilst the individuals with no history of mental health problems reported half that of the

clinical groups. Given that previous evidence has indicated high rates of sexual and physical abuse histories in people with psychosis (Mueser *et al.*, 2002), it is also interesting to note that within this study, individuals with psychosis and auditory hallucinations reported an average of 1.21 types of unwanted physical and sexual experiences, and 2.14 types of emotional abuse.

Previous research has also reported a gender bias in the types of traumas reported, with males typically reporting more physical traumas, and females reporting more sexual traumas (Mueser *et al.*, 2002). This gender bias was in part replicated within the clinical groups in this study for traumas relating to sexual abuse, with females in those groups reporting a greater average number of sexually abusive experiences than men. However, with the number of unwanted physical and sexual experiences combined, within the clinical groups, females reported a significantly greater average number of both types of trauma than males. Interestingly, this suggests that females with anxiety and/or depression or psychosis with auditory hallucinations had had a greater number of traumatic experiences relating to physical and sexual abuse than males, although it is important to consider that this finding could reflect a gender bias in the willingness of participants to report their experiences of trauma. Alternatively, it could reflect methodological limitations of sample selection for the clinical groups given that no such gender bias was found amongst the healthy volunteer sample.

It is also interesting to note that the individuals with psychosis and auditory hallucinations reported greater levels of overall emotional distress (as measured by the HADS), than the individuals with clinical levels of anxiety and/or depression. This finding, although not directly related to the current study, could be interpreted as evidence for anxiety and depression in the development and maintenance of hallucinations (Krabbendam *et al.,* 2004). However, the findings of the current study would need to be further substantiated in a larger and more representative sample of individuals with psychosis before any such conclusions could be drawn. It also highlights the importance of a thorough assessment and formulation of the different factors associated with psychosis, within clinical settings, in order to guide effective interventions.

The results from the between group comparisons in part support the first hypothesis that significant differences would be found between the psychosis group, emotional disorder group and healthy volunteer group on measures of trauma, dissociation and schizotypy. As predicted, individuals with psychosis and auditory hallucinations were found to score significantly higher than individuals in the healthy volunteer group on measures of these factors. However, contrary to prediction, analysis of differences between the two clinical

groups indicated that similar levels of overall trauma exposure and dissociation were found in individuals with psychosis and auditory hallucinations, and individuals with clinical levels of anxiety and/or depression, and that the two groups could not be significantly differentiated on these factors. Furthermore, in terms of the specific types of traumas experienced, both of the clinical groups reported comparable levels of trauma exposure related to crime, general disasters, unwanted sexual and physical experiences, and emotional abuse. This unexpected finding therefore suggests that the two clinical groups could not be differentiated on specific types of trauma either.

Given the trauma-psychosis association does not seem to have been explored previously in a clinical sample of individuals with anxiety and/or depression, it is not possible to say whether the similar overall levels of trauma reported in both the clinical groups in the current study is an accurate reflection of these groups in the general population. It is also interesting to note that the results from the between group comparisons within this study do suggest that trauma exposure may contribute to overall psychopathology, rather than psychopathology related specifically to psychotic disorder with auditory hallucinations.

In view of the finding of similar levels of overall dissociation between the two clinical groups, it is of particular interest to note that depersonalisation and derealisation was the only subcomponent of dissociation found to be significantly greater in individuals with psychosis and auditory hallucinations, than in individuals with anxiety and/or depression. In terms of dissociation, this finding suggests that individuals with psychosis and auditory hallucinations have significantly greater experiences of feeling detached from themselves and from their environment than individuals with anxiety and/or depression and individuals with no history of mental health problems. However, from the findings, it was not possible to differentiate the two clinical groups on other aspects of dissociation, such as amnesia and absorption/imaginative involvement, whilst healthy volunteers appeared to have significantly lower levels of dissociation than both clinical groups. Consequently, this provides particularly interesting information about the potential processes that distinguish individuals with psychosis and auditory hallucinations, from other clinical groups. Furthermore, it supports other research that indicates that the processes involved in depersonalisation and derealisation are specifically associated with hallucinations, such as Perona-Garcelan *et al.* (2008).

As the dissociation-psychosis association also appears to have never been explored in a sample of individuals with anxiety and/or depression, it is not possible to say whether the similar overall levels of trauma and dissociation reported in both the clinical groups in the

current study is an accurate reflection of these groups in the general population. However, from the current findings it appears that similarly to trauma, dissociative symptomatology related to amnesia, and absorption and imaginative involvement, may indicate overall psychopathology, but apparently not specific to either psychotic disorder (with auditory hallucinations) or emotional disorder.

On the other hand, significant differences in levels of schizotypal cognitions were indicated between all of the groups using less conservative analysis, with the psychosis group reporting more schizotypal cognitions than both the emotional disorder group and the healthy volunteer group. This suggests that individuals with psychosis and auditory hallucinations have significantly more bizarre and eccentric thought patterns associated with schizotypy, than individuals with anxiety and/or depression and individuals with no history of mental health problems. Given that these thought patterns are considered to reflect a style of information processing characterised by weak contextual integration which may render individuals more vulnerable to trauma related intrusions, this finding appears to confirm recent models of schizotypy that account for the role of trauma-related intrusions in psychosis (Holmes & Steel, 2004). It is also interesting to note that the emotional disorder group reported significantly greater levels of schizotypal cognitions than the healthy volunteer group, which suggests that individuals with anxiety and/or depression may also have lower levels of contextual integration and may consequently be more vulnerable to experiencing trauma related intrusions than individuals with no history of mental health problems.

Therefore, as was predicted, levels of trauma, dissociation and schizotypy appear to be significantly lower in individuals with no history of mental health problems than in individuals with psychotic disorders with auditory hallucinations. However, it is interesting to note that it was not possible to differentiate individuals with emotional or psychotic disorders on overall levels of trauma or dissociation. Nevertheless, and perhaps more interestingly, both schizotypy and dissociation related to depersonalisation and derealisation, seem to be more specific to individuals with psychosis and auditory hallucinations than to other clinical groups, such as those with emotional disorders. This finding is of particular interest in the current study, as it highlights the role of depersonalisation and derealisation, and schizotypal cognitions, specifically in psychosis with auditory hallucinations. However, given the characteristics of the psychosis group, from this finding alone it is not possible to identify whether depersonalisation and derealisation and schizotypy are associated with psychosis in general or auditory hallucinations in particular. Nevertheless, additional statistical analysis

provided further information about the association of these factors with auditory hallucinations.

The second hypothesis proposed that trauma, dissociation and schizotypy would have significant positive correlations with auditory hallucinations across the different groups. Two aspects of auditory hallucinations were investigated in particular (predisposition and severity) and the factors were found to be associated with these dimensions of auditory hallucinations to different extents.

In terms of predisposition to auditory hallucinations, trauma, dissociation and schizotypy were found to correlate strongly with this aspect of auditory hallucinations. Out of all the correlations measured across the three groups, of particular interest is the finding that the depersonalisation and derealisation subcomponent of dissociation had the strongest association with predisposition to auditory hallucinations. This supports the results of other recent related studies, such as that carried out by Moskowitz *et al.* (2005), in which a strong correlation was reported between dissociation and psychoticism in a student sample (Moskowitz *et al.*, 2005).

Equally, the strong correlation between schizotypal cognitions and predisposition to auditory hallucinations is of interest in light of the limited research previously carried out into the association between schizotypy and hallucinations. This lack of research may reflect the only recent advancements in dimensional perspectives of psychosis and its associated processes in the general population. Therefore, given that this area is still in the early stages of development, the absence of previous evidence limits the extent to which this reported strong association could be interpreted in the context of previous literature.

It is also interesting to note that in addition to the strong correlation between overall trauma exposure and predisposition to auditory hallucinations across the groups, emotional abuse was found to have the strongest association with predisposition to auditory hallucinations of all the different types of trauma experienced. Traumas relating to unwanted physical or sexual experiences, and general disasters, were also found to correlate significantly with predisposition to auditory hallucinations. This supports the findings of research carried out by Morrison & Peterson (2003) who reported particular associations between predisposition to auditory hallucinations and traumas relating to physical abuse, emotional abuse and bereavement.

On the other-hand, for severity of auditory hallucinations, the findings from this study suggest again that the depersonalisation and derealisation subcomponent of dissociation correlates most strongly with this dimension of auditory hallucinations. These results support the findings of Kilcommons & Morrison's (2005) study, in which the depersonalisation and derealisation component of dissociation was found to have a strong association with hallucinations. Equally, schizotypal cognitions were also found to have a strong correlation with severity of auditory hallucinations, although this too cannot be interpreted in the context of any previous literature.

Similarly, of all the types of trauma measured, emotional abuse appeared to have the strongest association with severity of auditory hallucinations, with a moderate association, whilst overall trauma had a weaker non-significant correlation across the three groups, which closely replicates the findings of previous related research. Kilcommons & Morrison (2005) for example reported from their study of the association between trauma and psychosis that lifetime trauma had a moderate association with hallucinations, which is comparable with the current study's reported association between overall trauma exposure and severity of auditory hallucinations.

Consequently, the associations between predisposition to, and severity of, auditory hallucinations and trauma, dissociation and schizotypal cognitions suggest that all of the factors measured are positively and significantly associated with predisposition to auditory hallucinations. Equally, all factors other than amnestic dissociation and trauma experiences (other than emotional abuse) were found to be positively and significantly associated with severity of auditory hallucinations. The outcome of further analyses of the key predictors of auditory hallucinations in this study can help us understand the nature of these associations in greater detail.

The final hypothesis proposed that the factors measured in this study would predict auditory hallucinations. Both depersonalisation and derealisation, and schizotypal cognitions, were found to be predictors of predisposition to auditory hallucinations. However, of the factors measured in this study, depersonalisation and derealisation was found to be the only predictor of severity of auditory hallucinations. This finding, although to be interpreted with caution, is particularly interesting as it highlights the important contribution of dissociative processes relating to depersonalisation and derealisation in the predisposition to, and severity of, auditory hallucinations, alongside the role of an information processing style characterised by weakened contextual integration in the predisposition to auditory hallucinations.

Taken together these findings suggest that schizotypy and depersonalisation and derealisation are important factors in the development of auditory hallucinations, whilst overall trauma seems to be associated to a lesser extent with predisposition to auditory hallucinations, and emotional abuse to severity of auditory hallucinations. It therefore seems possible to suggest that both depersonalisation and derealisation, and schizotypy, may influence the relationship between trauma and symptoms of psychosis, and may therefore be important factors in variation along the psychosis continuum. This fits with other recent work, such as that carried out by Marzillier & Steel (2007), Moskowitz *et al.* (2005), and Moskowitz & Corstens (2007), although as yet, there is no one conclusive model.

4.2. Theoretical Implications

The conceptualisation of dissociation as directly underlying hallucinations is in part supported by the finding in the current study that, of all the factors measured, the depersonalisation and derealisation subcomponent of dissociation has the strongest association with auditory hallucinations (for both predisposition and severity). This fits with other recent research from which Moskowitz *et al.* (2005) for example proposed that hallucinations are primarily dissociative in nature, and research from which Perona-Garcelian *et al.* (2008) proposed that dissociative processes are a prerequisite for auditory hallucinations. These assertions also support Allen *et al.*'s (1997) original model of the trauma-psychosis link, whereby the process of dissociation was understood to compromise reality testing and create a vulnerability to confusion and intrusive experiences.

Moskowitz & Corstens' (2007) neurocognitive account of hallucinations can further add to our understanding of the current findings of an association of trauma and dissociation with auditory hallucinations. They propose that during experiences of trauma, a disruption of memory systems contributes to symptoms that are dissociative in nature, such as hallucinations. This fits with other models of trauma that account for the disruptive effect of stress during traumatic experiences on the functioning of the hippocampus and subsequent encoding of memories (Jacobs & Nadel, 1998). Accordingly, it seems possible that a disruption to the encoding and processing of trauma-related information creates a cognitive vulnerability to the dissociative experiences associated with auditory hallucinations, particularly detachment from the self and the environment. Such perspectives add to our understanding of the neurocognitive processes associated with psychosis, and enable interpretation of the dissociative experiences found to be closely associated with, and to predict, auditory hallucinations within this study.

Similarly, the conceptualisation of a trauma related cognitive vulnerability to auditory hallucinations has also been recently supported by Steel *et al.* (2005) and Marzillier & Steel (2007). From an information-processing perspective of trauma-related intrusions (such as auditory hallucinations) the authors propose that a cognitive style of weakened integration of memories associated with schizotypal personality creates a vulnerability to subsequent intrusive thoughts. Consequently, it seems possible that in some cases, trauma acts as a predisposing factor to auditory hallucinations via a process of disruption to neurocognitive processes which may render individuals vulnerable to both the intrusive trauma-related and dissociative experiences found to be associated with auditory hallucinations. However, as yet, no one model of psychosis seems to exist that accounts for both schizotypal and dissociative processes together, and the findings in the current study highlight this as a limitation of the existing models. Equally, the current findings suggest that future theoretical accounts would do well to provide an account of the nature of these associations in greater detail.

To support a model of auditory hallucinations within which dissociation and schizotypy are proposed to have similar contributory factors, Giesbrecht *et al.* (2007) found a 58% overlap of the experiences underlying the two processes. More specifically, the authors reported that more that half of the dissociation-schizotypy overlap can be explained by childhood trauma, disruptions to attentional processes, and fantasy proneness. This finding can in part contribute to our understanding of the similar associations observed in the current study between schizotypy and auditory hallucinations, and dissociation and auditory hallucinations, and between schizotypy and dissociation directly. Furthermore, whilst highlighting the contribution of traumatic events to the cognitive processes associated with hallucinations, this finding may also suggest an overlap in the cognitive processes underlying both dissociation and schizotypy, which may or may not be accounted for by disrupted attentional processes or fantasy proneness. However, given the recent nature of this finding and the implication that a considerable amount of this overlap remains to be explained, evidence for the factors that contribute to the dissociation-schizotypy overlap requires to be further substantiated.

Consequently, many of the existing models of hallucinations seem to acknowledge the role of trauma as a predisposing factor, yet there does not seem to be a model of hallucinations that accounts for both schizotypal and dissociative processes together. Furthermore, many models, such as Kuipers *et al.'s* (2006), appear to account for neither of these processes directly. Therefore, in an attempt to make further sense of the findings of the current study, although apparently not considered by Giesbrecht *et al.* (2007) or other research, it may be reasonable to propose that one common factor underlying the schizotypal and dissociative processes

strongly associated with auditory hallucinations, is the compromised cognitive integration of negative or difficult experiences.

Accordingly, the weakened processes associated with schizotypy may contribute to recurrent intrusive trauma-related thoughts, whilst the processes of depersonalisation/derealisation may facilitate a detachment from those intrusive negative experiences and therefore contribute to individuals attributing their internal experiences as external in origin. Therefore, it is possible that an explanation of auditory hallucinations in particular, and psychosis in general, which accounts for weakened integration of information at different stages of the hallucinatory experience may contribute to the understanding of the different factors considered in this study. However, there is no doubt that this hypothesis is highly speculative at this point in time.

4.3. Clinical Implications

From these theoretical perspectives of the current findings, a number of clinical implications can also be drawn on to guide clinical practice, particularly in the assessment and treatment of people with psychosis, and the identification of those 'at risk' of developing psychosis.

The results suggest that trauma, dissociation and schizotypy are important factors to consider in the clinical assessment and treatment of people with psychosis and auditory hallucinations. Accordingly, it is likely that such an assessment will not only consider symptoms of psychosis, but also the key psychological factors that underlie those symptoms and could guide a detailed developmental formulation. Based on the findings in the current study, it is possible that such a comprehensive formulation could include trauma as a predisposing factor, alongside the potential role of cognitive processes associated with dissociation and schizotypy in the development and maintenance of symptoms.

With a greater understanding of the key factors associated with hallucinations and their interrelationships, clinicians may then be guided to focus treatment on these underlying factors, rather than on the psychotic symptoms per se. More specifically, the findings of the current study would support interventions that consider individuals experiences of trauma, such as emotional abuse, where indicated. The aim of such work may be to encourage the processing and integration of distressing memories, and thereby reduce dissociative or intrusive experiences strongly associated with hallucinations (Briere, 1996).

A comprehensive formulation may also guide the selection of a cognitive approach to treatment to address these different factors (Morrison *et al.,* 2004b). Furthermore, where

indicated, a person based cognitive therapy approach (as described by Chadwick, 2006) could offer an additional mindfulness perspective to any cognitive work carried out, with the aim of reducing an individual's tendency to dissociate in the face of difficult memories and emotions. Equally, Perona-Garcelan *et al.* (2008) suggest reducing dissociative symptomatology directly through attentional training techniques, as described by Wells (2000).

An understanding of the factors associated with predisposition to auditory hallucinations, may not only contribute to the development of effective treatments for psychosis, but may also contribute to the identification of those 'at risk' of developing symptoms of psychosis. The findings from the between group comparisons within this study suggest that individuals with an emotional disorder and high levels of depersonalisation and derealisation, and/or schizotypy may be at greatest risk of developing intrusive experiences associated with hallucinations. Therefore, early intervention for people identified as at risk of progression to the early stages of psychosis could then prevent the development of normal psychotic-like experiences to psychotic symptomatology.

The effectiveness of early intervention has recently been the focus of research attention (Killackey & Young, 2007), and evidence has suggested that cognitive therapy is an effective intervention for reducing the likelihood of transition to psychosis (Morrison *et al.*, 2004a). More specifically, Morrison *et al.* (2004a) found that cognitive therapy reduced the likelihood of making progression to psychosis over 12 months, and reduced the prescription of antipsychotic medication and the likelihood of individuals meeting criteria for a DSM-IV diagnosis of a psychotic disorder. This highlights the utility of the current research to contribute to our understanding of the key predictors of symptoms of psychosis, and therefore enable early identification and effective intervention. However, further research would be required to substantiate these findings and explore these associations further in other clinical groups.

4.4. Critique of the Study

Despite the significant findings reported, it is important to acknowledge several restrictions of the current exploratory analysis. In terms of the study's design, it is of value to recognise limitations of the conclusions which can be drawn from a quasi-experimental methodology. Within the current study participants were recruited to one of three groups on the grounds of their experiences of psychosis, anxiety and/or depression, or absence of a mental health problem. Accordingly, it was not possible to minimise the confounding effect of additional sources of variance between the groups, such as IQ or socio-economic status, as would have

been more feasible had sample selection been carried out on a more randomised basis (Clark-Carter, 2004). Furthermore, given that it was not possible to control for any additional variables effecting hallucinations within the resources available, it has not been possible to comment on the confounding effect of additional factors, such as PTSD, on the reported associations between trauma, dissociation, schizotypy and auditory hallucinations (Clark-Carter, 2004). It is therefore possible that other important variables not considered within this study may have had an effect on the reported associations between the factors measured, and had greater resources been available it would have been of value to measure and subsequently control for some of the potential extraneous variables. Such an observation is a limitation common to many studies measuring the relationship between specific psychological factors and symptoms of psychosis (i.e. Perona-Garcelan *et al*, 2008) and is a valuable issue to consider in any such future research.

Importantly, a sample of 44 participants across three groups limits generalisation of the findings to wider clinical and non-clinical populations. The small sample size and associated problems with statistical power may also explain why some of the hypothesised associations between specific types of trauma and severity of auditory hallucinations were not indicated. Equally, due to the restriction of referrals it was not possible to match participants on age and gender, which would have reduced related effects, particularly for gender.

Further methodological limitations include the reliance of data collection on participants' self-reports, due to the difficulty of confirming the reliability of participants' reports. Despite the choice of a self-report methodology being supported by related evidence (as described in Chapter 2) it is possible that the quantification of trauma history may be less reliable, given the limitations of participants with a complex trauma history recalling their experiences accurately, and for these experiences to then be coded consistently across participants. The inter-related nature of different types of trauma and the difficulty with attempting to quantify experiences of physical, sexual and emotional abuse separately may further compromise the reliability of the subscale scores. However, an attempt was made in this study to compensate for the absence of a standard scoring system for the chosen trauma measure by using the same method as Kilcommons & Morrison (2005) (i.e. counting the number of different types of traumatic experiences reported). Nevertheless, there still remains the difficulty of quantifying the multi-dimensional nature of trauma. Consequently, future research would benefit from a standardised approach to measuring the stage at which trauma events occur, such as childhood and adulthood, and whether events are single or repeated, in addition to measuring the number of different types of trauma experiences.

In terms of recruitment, participants for the clinical samples were recruited from people attending NHS Mental Health Services, engaging in psychological therapy and/or psychiatric treatment, and willing to volunteer in the study. First, it is likely that these samples are not entirely representative of their respective populations, as depending on the stage of psychological therapy and the potentially confounding effect of medication, participants within the clinical groups may report lower levels of symptomatology than similar others not engaged in such services. Secondly, the voluntary nature of participation is selective in itself of people who are more willing to discuss their experiences, whilst probably excluding those who are more distressed by, or avoidant about, their experiences. Consequently, a key limitation of this study is that sample selection was convenient in nature rather than randomly selected from their respective populations, therefore limiting the generalisability of the findings.

Furthermore, from the study it is difficult to form evidence-based conclusions about the potential mediating role of trauma, dissociation and schizotypy in the development of hallucinations. Had it been possible to recruit a larger sample, then it may have been possible to carry out additional statistical analysis, which may have further contributed to our understanding of the mediating role of these factors. Similarly, any conclusions drawn about the direction of causality can only be formed tentatively.

It has also been out-with the remit of this study to consider the role of other important psychological factors associated with hallucinations, such as PTSD (Holmes *et al.*, 2004), meta-cognitive beliefs (Morrison *et al.,* 1995) and emotions (Garety *et al.,* 2001) (as described in Chapter 1). In terms of PTSD in particular, we could hypothesise, from the findings of previous research (Gracie *et al.,* 2007; Holmes *et al.,* 2004) and the current study that trauma-related processes involved in PTSD are strongly associated with the factors considered in this study, and an important factor to consider in future related research.

On the other hand, it is a strength of the study design that the research was carried out in clinical and non-clinical populations, as Morrison & Peterson (2003) recommended following their research carried out on a non-clinical population, which increases the generalizability of the findings. However, it would also be interesting for this study to be replicated with an additional group of participants who have a diagnosis of psychosis but no experience of auditory hallucinations. This would act as a control for the existing group of participants who had psychosis and auditory hallucinations, and would enable further conclusions to be drawn about auditory hallucinations in the context of psychosis.

The use of a quantitative methodology facilitates the exploration of individuals' experiences at a symptom level. However, the assessment of symptom dimensions fails to recognise valuable qualitative aspects of individual's experiences, such as the content of their experiences, alongside the phenomenological associations between the different factors measured. This is an obvious limitation of the current study, although participant's experiences of auditory hallucinations were captured to some extent by the recordings of several participants' interviews with the researcher about their experiences of auditory hallucinations. Given the value of these interviews in the interpretation of the results of the current study, extracts from the discussions that took place during the administration of the PSYRATS, are presented in the appendices (with participant's consent) (see Appendix 6). Of particular interest are participants' own views about the causes of their hallucinatory experiences, therefore a selection of these extracts have been presented in particular, with emotional and sexual abuse during childhood reported as a key causal factor.

4.5 Future Research

From the limitations discussed above, it is apparent that the findings of the current study need to be replicated in larger clinical and non-clinical samples to confirm the reported associations. In terms of sample selection it would be of interest for this study to be replicated with an additional group of individuals with psychosis and no history of auditory hallucinations. It would also be of value for any future related research to take into account the methodological limitations described above.

The mediating role of the factors measured in this study, alongside other important psychological factors such as PTSD, may also be an area of interest for future research. Similarly, it would be of interest to further explore the overlapping and separate cognitive processes associated between dissociation and schizotypy, whilst it would also be of value to compare how the strength of associations found in this study compare to the strength of association between these factors and other symptoms of psychosis, such as delusions. More specifically, because Kilcommons & Morrison (2005) found that physical abuse predicted positive symptoms in general, whilst sexual abuse predicted auditory hallucinations in particular, it would be interesting for future research to examine how strongly trauma, dissociation and schizotypy are associated with delusions, as they appear to have different correlates.

4.6. Conclusions

In summary, the findings of this exploratory study indicate that trauma, dissociation and schizotypy are important factors in the predisposition to, and severity of, auditory hallucinations, across clinical and non-clinical populations. In particular, the results highlight the significant role of depersonalisation and derealisation and schizotypal cognitions in the prediction of auditory hallucinations. Consequently, it is encouraging that the findings from the analyses carried out are consistent for both dimensions of auditory hallucinations measured (predisposition and severity), albeit that more factors were found to correlate with predisposition to auditory hallucinations than severity of auditory hallucinations, as could be expected.

Given that these correlations appear to be supportive of previous research into factors associated with psychosis related experiences, such as auditory hallucinations or psychoticism, it seems reasonable to conclude that of these factors, the depersonalisation and derealisation subcomponent of dissociation and schizotypy in particular, are important factors in the development of auditory hallucinations. Therefore, it also seems reasonable to conclude that depersonalisation and derealisation, and schizotypy, may contribute to variation along the psychosis continuum. Accordingly, within the context of existing neurocognitive and cognitive models of hallucinations, it is possible that in some cases, trauma acts as a predisposing factor to auditory hallucinations via a process of disruption to neurocognitive processes, and creating a vulnerability to the intrusive trauma-related and dissociative experiences associated with auditory hallucinations. Furthermore, compromised cognitive integration of negative experiences has been tentatively suggested as a common factor underlying these important dissociative and schizotypal processes in auditory hallucinations.

However, to advance our understanding of factors associated with psychosis in general, and auditory hallucinations in particular, there is a need for further research and for existing cognitive models to provide a more comprehensive account of the factors involved in the development of auditory hallucinations. Similarly, the transferability of these models into clinical practice must be considered to inform the ongoing development of evidence-based treatments.

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APPENDICES

Appendix 1: Ethics Committee Certificate
Appendix 2: Inclusion and Exclusion Criteria
Appendix 3: Questionnaires (DES, THQ, RHS & PSYRATS)
Appendix 4: Data Output- One way ANOVAs (for Hallucinatory & Factor Variables)
Appendix 5: Correlation Models
Appendix 6: Participant Quotes

Appendix 1: Ethics Committee Certificate

Lothian NHS Board

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Dear Miss Hardie

Full title of study: **Predictors of Auditory Hallucinations**
REC reference number: **07/S1101/25**

Thank you for your letter, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair, Vice-Chair and Dr K Smith.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

Ethical review of research sites

The Committee has designated this study as exempt from site-specific assessment (SSA). The favourable opinion for the study applies to all sites involved in the research. There is no requirement for other Research Ethics Committees to be informed or SSA to be carried out at each site.

Conditions of approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

NHS
Lothian

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

Feedback on the application process

Now that you have completed the application process you are invited to give your view of the service you received from the National Research Ethics Service. If you wish to make your views known please use the feedback form available on the NRES website at:

https://www.nresform.org.uk/AppForm/Modules/Feedback/EthicalReview.aspx

We value your views and comments and will use them to inform the operational process and further improve our service.

07/S1101/25	~	**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project

Yours sincerely

pp **Mr Nicholas Grier**
Chair

Enclosures: *Standard approval conditions*

Copy to: *University of Edinburgh*
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Appendix 2: Inclusion and Exclusion Criteria

For recruitment of participants to the study, inclusion and exclusion criteria for the three groups are presented below:

Inclusion Criteria

Psychosis Group	Emotional Disorder Group	Healthy Volunteer Group
-18-65 years of age -Clinical diagnosis of schizophrenia, schizophreniform disorder, schizoaffective disorder & other psychotic disorder not specified -Receiving treatment for psychosis -Experience of auditory hallucinations over the past week -Individuals sufficiently mentally stable (to attend to task)	-18-65 years of age -Clinical diagnosis of anxiety or depressive disorder -Receiving treatment for anxiety or depression -Above cut-off on Hospital Anxiety and Depression Scale -Individuals sufficiently mentally stable (to attend to task)	-18-65 years of age -Absence of mental health problems/diagnosis/treatment (past or present) -Below cut-off on Hospital Anxiety and Depression Scale

Exclusion Criteria

Psychosis Group	Emotional Disorder Group	Healthy Volunteer Group
-Out with the 18-65 years of age -Evidence that diagnosis is due to the direct physiological effects of a substance/neurological/other general medical condition -Diagnosis of an organic impairment/dementia -Deemed incapable of having a full understanding of what participation may entail as a result of cognitive impairment -Unable to respond to the questions without support -Experience of trauma within four weeks before participation in the study -Diagnosis of a learning disability -English is not first language -Patients held under the Mental Health (Scotland) Act (2003)	-Out with the 18-65 years of age -Current diagnosis of a psychotic illness (i.e. schizophrenia or schizoaffective disorder) -Diagnosis is due to the direct physiological effects of a substance/neurological/other general medical condition -Diagnosis of an organic impairment/dementia -Deemed incapable of having a full understanding of what participation may entail as a result of cognitive impairment -Unable to respond to the questions without support -Experience of trauma within four weeks before participation in the study -Diagnosis of a learning disability -English is not first language -Patients held under the Mental Health (Scotland) Act (2003)	-Out with the 18-65 years of age -Mental health problems/diagnosis/treatment (past or present) -Experience of trauma within four weeks before participation in the study -Diagnosis of a learning disability -English is not first language -Above cut-off on Hospital Anxiety and Depression Scale

Appendix 3: Questionnaires

Dissociative Experiences Scale

This questionnaire consists of twenty-eight questions about experiences that you may have in your daily life. We are interested in how often you have these experiences. It is important, however, that your answers show how often these experiences happen to you when you **are not** under the influence of alcohol or drugs. To answer the questions, please determine to what degree the experience described in the question applies to you and circle the number to show what percentage of the time you have the experience.

Example:

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

1. Some people have the experience of driving a car and suddenly realizing that they don't remember what has happened during all or part of the trip. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

2. Some people find that sometimes they are listening to someone talk and they suddenly realize that they did not hear all or part of what
was said. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

3. Some people have the experience of finding themselves in a place and having no idea how they got there. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

4. Some people have the experience of finding themselves dressed in clothes that they don't remember putting on. Circle a number to show
what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

5. Some people have the experience of finding new things among their belongings that they do not remember buying. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

6. Some people sometimes find that they are approached by people that they do not know who call them by another name or insist that they have met them before. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

7. Some people sometimes have the experience of feeling as though they are standing next to themselves or watching themselves do something as if they were looking at another person. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

8. Some people are told that they sometimes do not recognize friends or family members. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

9. Some people find that they have no memory for some important events in their lives (for example, a wedding or graduation). Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

10. Some people have the experience of being accused of lying when they do not think that they have lied. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

11. Some people have the experience of looking in a mirror and not recognizing themselves. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

12. Some people sometimes have the experience of feeling that other people, objects, and the world around them are not real. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

13. Some people sometimes have the experience of feeling that their body does not belong to them. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

14. Some people have the experience of sometimes remembering a past event so vividly that they feel as if they were reliving that event. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

15. Some people have the experience of not being sure whether things that they remember happening really did happen or whether they just dreamed them. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

16. Some people have the experience of being in a familiar place but finding it strange and unfamiliar. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

17. Some people find that when they are watching television or a movie they become so absorbed in the story that they are unaware of other events happening around them. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

18. Some people sometimes find that they become so involved in a fantasy or daydream that it feels as though it were really happening to them. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

19. Some people find that they are sometimes able to ignore pain. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

20. Some people find that they sometimes sit staring off into space, thinking of nothing, and are not aware of the passage of time. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

21. Some people sometimes find that when they are alone they talk out loud to themselves. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

22. Some people find that in one situation they may act so differently compared with another situation that they feel almost as if they were different people. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

23. Some people sometimes find that in certain situations they are able to do things with amazing ease and spontaneity that would usually be difficult for them (for example, sports, work, social situations, etc.). Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

24. Some people sometimes find that they cannot remember whether they have done something or have just thought about doing that thing (for example, not knowing whether they have just mailed a letter or have just thought about mailing it). Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

25. Some people find evidence that they have done things that they do not remember doing. Circle a number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%
(never) (always)

26. Some people sometimes find writings, drawings, or notes among their belongings that they must have done but cannot remember doing. Circle a number to show what percentage of the time this happens to you.

0% (never)	10	20	30	40	50	60	70	80	90	100% (always)

27. Some people find that they sometimes hear voices inside their head that tell them to do things or comment on things that they are doing. Circle a number to show what percentage of the time this happens to you.

0% (never)	10	20	30	40	50	60	70	80	90	100% (always)

28. Some people sometimes feels as if they are looking at the world through a fog so that people or objects appear far away or unclear. Circle a number to show what percentage of the time this happens to you.

0% (never)	10	20	30	40	50	60	70	80	90	100% (always)

Trauma History Questionnaire

The following question is about serious or traumatic life events. These types of events actually occur with some regularity, although we would like to believe they are rare, and they affect how people feel about, react to, and/or think about things subsequently. The question is divided into different types of stressful life events i) crime experiences ii) general disaster iii) physical and sexual experiences iv) other.

For each event, please indicate (circle) whether it happened, and if it did, the number of times and your approximate age when it happened (give your best guess if you are not sure). Also note the circumstances and specific nature of the event, if appropriate.

		No/Yes (please circle)	If Yes No of Times Approx. Age
	Crime Related Events		
1	Has anyone ever tried to take something directly from you by using force or the threat of force, such as a stick-up or mugging?	**No/Yes**	
2	Has anybody ever attempted to rob you or actually robbed you (i.e. stolen your personal belongings)?	**No/Yes**	
3	Has anyone ever attempted to or succeeded in breaking into your home when you weren't there?	**No/Yes**	
4	Has anyone ever tried to or succeeded in breaking into your home while you were there?	**No/Yes**	
	General Disaster & Trauma		
5	Have you ever had a serious accident at work, in a car or somewhere else? If yes, please specify:	**No/Yes**	
6	Have you ever experienced a natural disaster such as a tornado, hurricane, flood, major earthquake, etc., where you felt you or your loved ones were in danger of death or injury? If yes, please specify:	**No/Yes**	
7	Have you ever experienced a "man-made" disaster such as a train crash, building collapse, bank robbery, fire, etc., where you felt you or your loved ones were in danger of death or injury? If yes, please specify:	**No/Yes**	
8	Have you ever been exposed to dangerous chemicals or radioactivity that might threaten your health?	**No/Yes**	
9	Have you ever been in any other situation in which you were seriously injured? If yes, please specify:	**No/Yes**	
10	Have you ever been in any other situation in which you feared you might be killed or seriously injured? If yes, please specify:	**No/Yes**	
11	Have you ever seen someone seriously injured or killed? If yes, please specify who:	**No/Yes**	
12	Have you ever seen dead bodies (other than at a funeral) or had to handle dead bodies for any reason? If yes, please specify:	**No/Yes**	
13	Have you ever had a close friend or family member murdered, or killed by a drunk driver? If yes, please specify relationship (e.g. mother, grandson, etc):	**No/Yes**	

14	Have you ever had a spouse, romantic partner, or child die? If yes, please specify relationship:	**No/Yes**	
15	Have you ever had a serious or life-threatening illness? If yes, please specify:	**No/Yes**	
16	Have you ever received news of a serious injury, life-threatening illness or unexpected death of someone close to you? If yes, please indicate:	**No/Yes**	
17	Have you ever had to engage in combat while in military service in an official or unofficial war zone? If yes, please indicate where:	**No/Yes**	
	Physical & Sexual Experiences		**If Yes** **Was it repeated? How often?**
18	Has anyone ever made you have intercourse, oral or anal sex against your will? If yes, please indicate nature of relationship with person (e.g. stranger, friend, relative, parent, sibling etc):	**No/Yes**	
19	Has anyone ever touched private parts of your body, or made you touch theirs under force or threat? If yes, please indicate nature of relationship with person (e.g. stranger, friend, relative, parent, sibling etc):	**No/Yes**	
20	Other than incidents mentioned in Qu 18 & Qu 19, have there been any other situations in which another person tried to force you to have unwanted sexual contact?	**No/Yes**	
21	Has anyone, including family members or friends, ever attacked you with a gun, knife or some other weapon?	**No/Yes**	
22	Has anyone, including family members or friends, ever attacked you without a weapon or seriously injured you?	**No/Yes**	
23	Has anyone in your family ever beaten, 'spanked' or pushed you hard enough to cause injury?	**No/Yes**	
24	Have you experienced any other extraordinarily stressful situation or event that is not covered above? If yes, please specify:	**No/Yes**	

generally agree with it by **circling** the appropriate number. Please respond to **all the items**, there are no right or wrong answers. Do not spend too much time thinking about each one.

	Never	Sometimes	Often	Almost Always
1. I daydream about being someone else.	1	2	3	4
2. I hear a voice speaking my thoughts aloud.	1	2	3	4
3. A passing thought will seem so real that it frightens me.	1	2	3	4
4. I imagine myself off in far distant places.	1	2	3	4
5. I fantasise about being someone else.	1	2	3	4
6. In my daydreams I can hear the sound of a tune almost as clearly as if I were actually listening to it.	1	2	3	4
7. I hear the telephone ring and find that I am mistaken.	1	2	3	4
8. I hear people call my name and find that nobody has done so.	1	2	3	4
9. I have heard the voice of God speaking to me.	1	2	3	4
10. The people in my daydreams seem so true to life that I think they are real.	1	2	3	4
11. No matter how much I try to concentrate on my work unrelated thoughts always creep into my mind.	1	2	3	4
12. I can see thing strongly in my daydreams.	1	2	3	4
13. I can hear music when it is not being played.	1	2	3	4
14. I have seen a person's face in front of me when no one was there.	1	2	3	4
15. I can see the people in my daydreams very clearly.	1	2	3	4
16. My thoughts seem as real as actual events in my life.	1	2	3	4
17. I have a vivid imaginary life.	1	2	3	4
18. I have had the experience of hearing a person's voice and then found that there was no one there.	1	2	3	4
19. When I look at things they look unreal to me.	1	2	3	4
20. I see shadows and shapes when there is nothing there.	1	2	3	4
21. I have been troubled by hearing voices in my head.	1	2	3	4
22. When I look at myself in the mirror I look different.	1	2	3	4
23. The sounds I hear in my daydreams are generally clear and distinct.	1	2	3	4
24. When I look at things they appear strange to me.	1	2	3	4

Psychotic Symptom Rating Scale

The following structured interview is designed to elicit specific details regarding different dimensions of auditory hallucinations. When asking questions, the interview is designed to rate the patient's experiences over the last week for the majority of items. There are 2 exceptions to this e.g. when asking about beliefs regarding causes of voices, rate the patients response based on what they believe at the time of interview. Also loudness of voice should be rated according to loudness of the voice at the time of interview or the last time they were experienced.

"Over the past week, can you think of a time when you have heard voices?" YES/NO

If YES, "let me know if any of your answers to the following questions are different for different voices"

If NO, "can you think of a time when you have ever heard voices?" YES/NO

Diagnosis (if relevant):

Length of time experiencing voices:

Hallucinations in other modalities (visual/olfactory/tactile/gustatory):

Auditory Hallucinations Scale

Number of Voices:
How many different voices have you heard over the last week/month?
Number of Voices:
Form of Voices:

1st person	Yes/No	n=
2nd person	Yes/No	n=
3rd person	Yes/No	n=
Single wds	Yes/No	n=

1. Frequency	How often do you experience voices? (every day, all day long etc)?
0	Voices not present or present less than once a week
1	Voices occur for at least once a week
2	Voices occur at least once a day
3	Voices occur at least once a hour
4	Voices occur continuously or almost continuously i.e. stop for only a few seconds or minutes

2. Duration	When you hear your voices, how long do they last e.g. few secs, mins, hrs, all day long?
0	Voices not present
1	Voices last for a few seconds, fleeting voices
2	Voices last for several minutes
3	Voices last for at least one hour
4	Voices last for hours at a time

3. Location	When you hear voices where do they sound like they're coming from? e.g. inside/outside your head? If outside, where do they sound like they are coming from?
0	No voices present
1	Voices sound like they are inside head only
2	Voices outside the head, but close to ears or head. Voices inside the head may also be present
3	Voices sound like they are inside or close to ears and outside head away from ears
4	Voices sound like they are from outside the head only

4. Loudness	How loud are your voices? Are they louder than your voice, about the same loudness, quieter or just a whisper?
0	Voices not present
1	Quieter than own voice, whispers

2	About same loudness as own voice
3	Louder than own voice
4	Extremely loud, shouting

5. Beliefs re origin of voices	What do you think has caused your voices? Are the voices caused by factors related to yourself or solely due to other people or factors? If external, how much do you believe that your voices are caused by (attribution) on a scale from 0-100 with 100 being that you are totally convinced & 0 being that it is completely untrue?
0	Voices not present
1	Believes voices to be solely internally generated and related to self
2	Holds < 50% conviction that voices originate from external causes
3	Holds >or=to 50% conviction (but < 100%) that voices originate from external causes
4	Believes voices are solely due to external causes (100% conviction)

6. Amount of negative content of voices	Do your voices say unpleasant or negative things? Can you give me some examples of what the voices say? How much of the time do the voices say these types of unpleasant/negative things?
0	No unpleasant content
1	Occasional unpleasant content (< 10%)
2	Minority of voice content is unpleasant or negative (< 50%)
3	Majority of voice content is unpleasant or negative (>or=to 50%)
4	All of voice content is unpleasant or negative

7. Degree of negative content	How negative are the voices?
0	Not unpleasant or negative
1	Some degree of negative content, but not personal comments relating to self or family e.g. swear words or comments not directed to self, e.g. 'the milkman's ugly'
2	Personal verbal abuse, comments on behaviour e.g. 'shouldn't do that or say that'
3	Personal verbal abuse relating to self-concept e.g. 'you're lazy, ugly, mad, perverted'
4	Personal threats to self e.g. threats to harm self or family, extreme instructions or commands to harm self or others

8. Amount of distress	Are your voices distressing? How much of the time?
0	Voices not distressing at all
1	Voices occasionally distressing, majority not distressing (< 10%)
2	Minority of voices distressing (< 50%)
3	Majority of voices distressing, minority not distressing (>or=to 50%)
4	Voices always distressing

9. Intensity of distress	When voices are distressing, how distressing are they? Do they cause you minimal, moderate or severe distress? Are they the most distressing they have ever been?
0	Voices not distressing at all
1	Voices slightly distressing
2	Voices are distressing to a moderate degree
3	Voices are very distressing, although subject could feel worse
4	Voices are extremely distressing, feel the worst he/she could possibly feel

10. Disruption to life caused by voices	How much disruption do the voices cause to your life? Do the voices stop you from working or other daytime activities? Do they interfere with your relationships with friends and/or family? Do they prevent you from looking after yourself e.g. bathing, changing clothes etc?
0	No disruption to life, able to maintain social and family relationships (if present)
1	Voices causes minimal amount of disruption to life e.g. interferes with concentration although able to maintain daytime activity and social and family relationships and be able to maintain independent living without support
2	Voices cause moderate amount of disruption to life causing some disturbance to daytime activity and/or family or social activities. The patient is not in hospital although may live in supported accommodation or receive additional help with daily living skills

3	Voices cause severe disruption to life so that hospitalisation is usually necessary. The patient is able to maintain some daily activities, self-care and relationships while in hospital. The patient may also be in supported accommodation but experiencing severe disruption of life in terms of activities, daily living skills and/or relationships
4	Voices cause complete disruption of daily life requiring hospitalization. The patient is unable to maintain any daily activities and social relationships. Self-care is also severely disrupted.

11. Controllability of voices	**Do you think you have any control over when your voices happen? Can you dismiss or bring on your voices?**
0	Subject believes they can have control over the voices and can always bring on or dismiss them at will
1	Subject believes they can have some control over the voices on the majority of occasions
2	Subject believes they can have some control over their voices approximately half of the time
3	Subject believes they can have some control over their voices but only occasionally. The majority of the time the subject experiences voices which are uncontrollable
4	Subject has no control over when the voices occur and cannot dismiss or bring them on at all

Appendix 4: Data output- One-way ANOVAs

Factor Variables

		Sum of Squares	df	Mean Square	F	Sig.
HADS Total score	Between Groups	2141.678	2	1070.839	39.079	.000
	Within Groups	1123.481	41	27.402		
	Total	3265.159	43			
RISC Total score	Between Groups	2430.688	2	1215.344	9.639	.000
	Within Groups	5169.562	41	126.087		
	Total	7600.250	43			
DES Amnestic Dissociation subscale score	Between Groups	74261.147	2	37130.574	1.876	.166
	Within Groups	811654.762	41	19796.458		
	Total	885915.909	43			
DES Absorption & Imaginative Involvement subscale score	Between Groups	422404.870	2	211202.435	6.558	.003
	Within Groups	1320492.857	41	32207.143		
	Total	1742897.727	43			
DES Depersonalisation & Derealisation subscale score	Between Groups	129163.528	2	64581.764	10.170	.000
	Within Groups	260352.381	41	6350.058		
	Total	389515.909	43			
DES Total	Between Groups	2246010.000	2	1123005.000	5.006	.011
	Within Groups	9196990.000	41	224316.829		
	Total	11443000.000	43			
THQ- sum of crime related traumas	Between Groups	.170	2	.085	.082	.921
	Within Groups	42.262	41	1.031		
	Total	42.432	43			
THQ- sum of general disaster & traumas	Between Groups	20.264	2	10.132	2.790	.073
	Within Groups	148.895	41	3.632		
	Total	169.159	43			
THQ- sum of sexual & physical experiences combined	Between Groups	15.643	2	7.821	4.313	.020
	Within Groups	74.357	41	1.814		
	Total	90.000	43			
THQ- sum of emotionally abusive exp	Between Groups	17.530	2	8.765	3.060	.058
	Within Groups	117.448	41	2.865		
	Total	134.977	43			
THQ Total- sum of all types of trauma exposure	Between Groups	148.165	2	74.082	3.984	.026
	Within Groups	762.381	41	18.595		
	Total	910.545	43			

Hallucinatory Variables

		Sum of Squares	df	Mean Square	F	Sig.
RHS Predisposition to Auditory Hallucinations subscale score	Between Groups	9.034	2	4.517	38.681	.000
	Within Groups	4.788	41	.117		
	Total	13.822	43			
RHS Total score	Between Groups	2845.491	2	1422.746	17.239	.000
	Within Groups	3383.690	41	82.529		
	Total	6229.182	43			
PSYRATS Total Score	Between Groups	10350.049	2	5175.024	193.427	.000
	Within Groups	1096.929	41	26.754		
	Total	11446.977	43			

Appendix 2

Figure 6. Models of associations between predictor variables and predisposition to auditory hallucinations

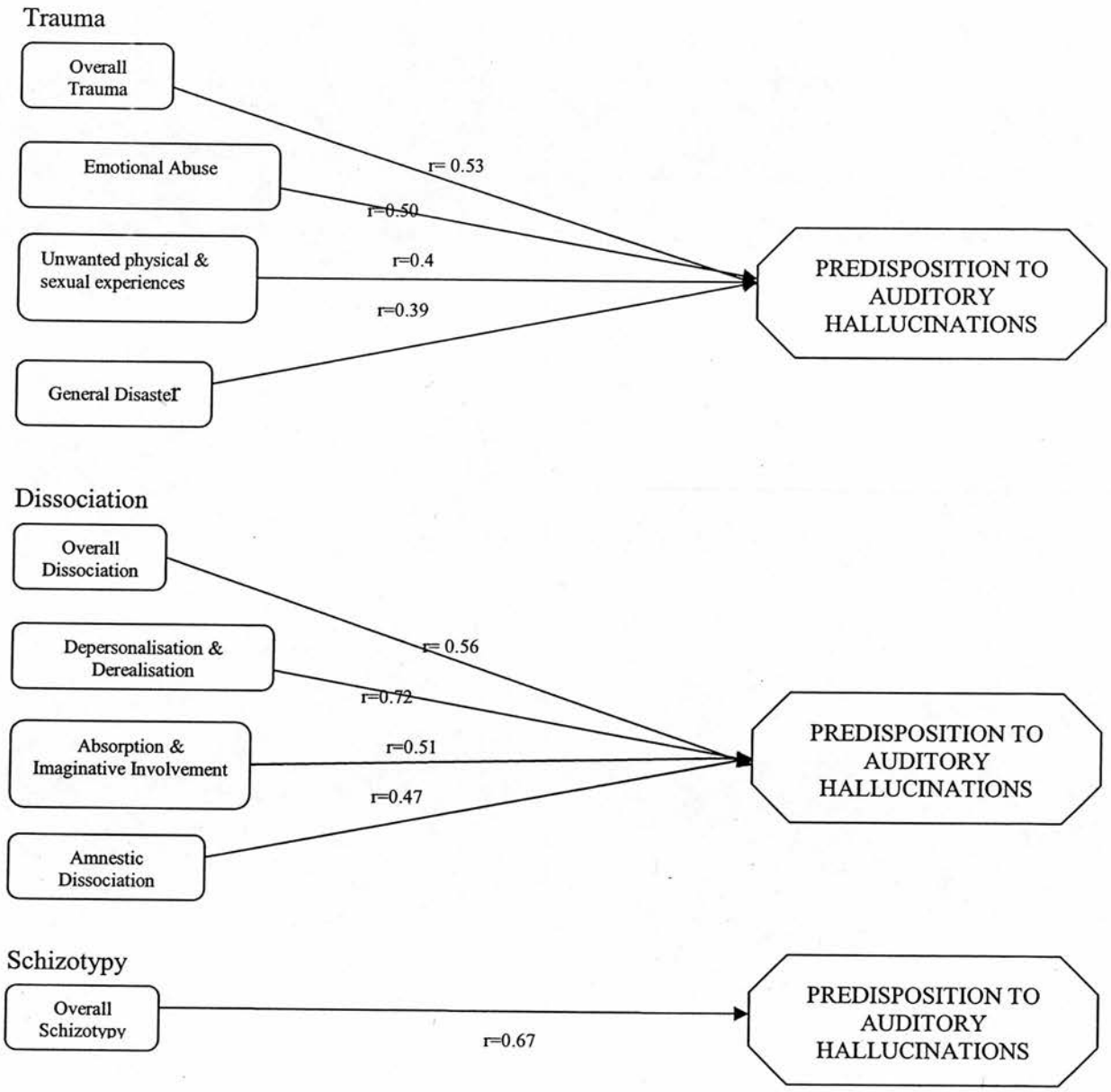
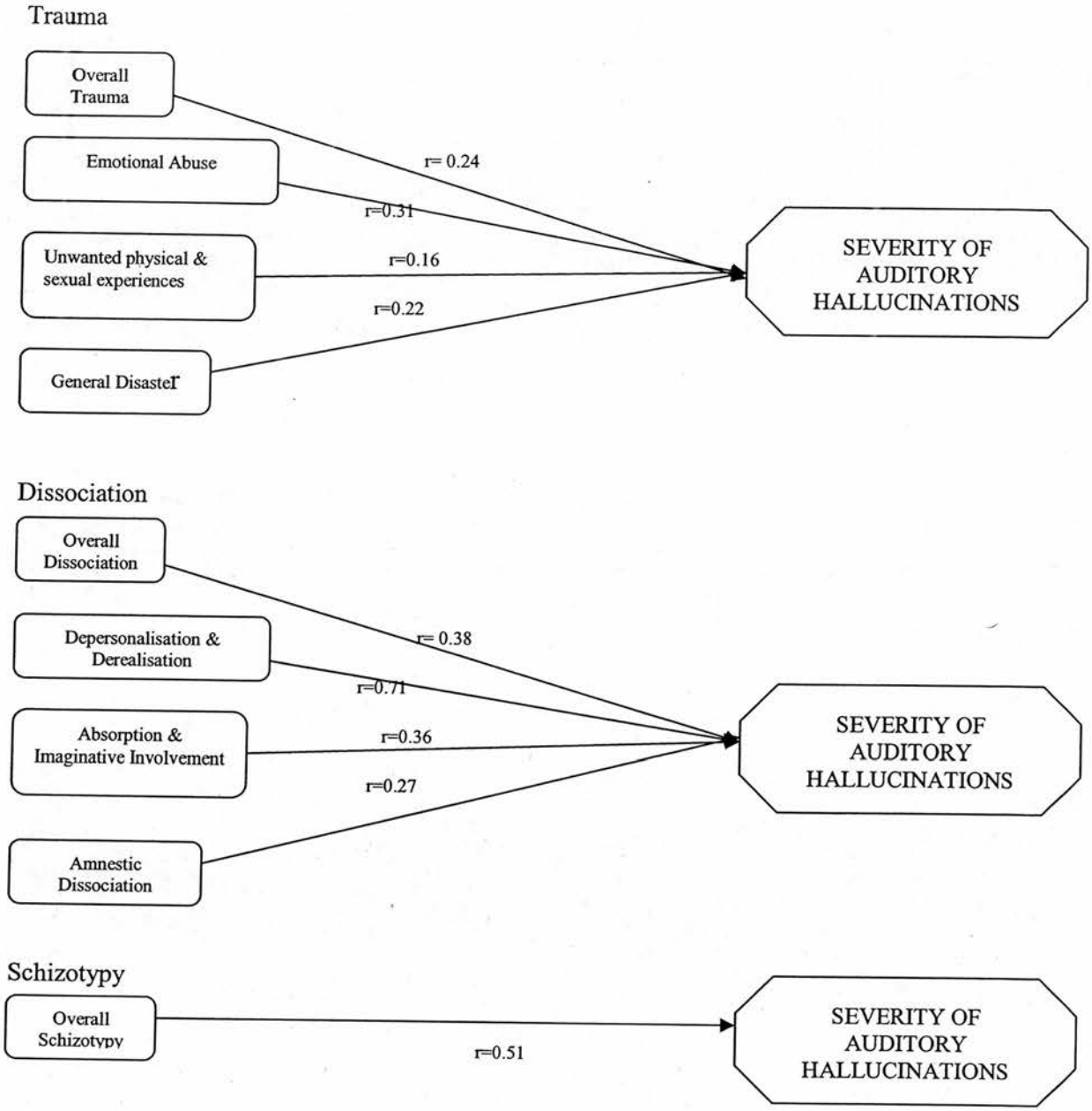


Figure 7. Models of associations between predictor variables and severity of auditory hallucinations



Appendix 6: Participant Quotes

A selection of narratives taken from interviews (using the Psychotic Symptom Rating Scale) with individuals with psychosis and auditory hallucinations are presented below:

Interviewer:

"What do you think has caused your voices?"

Participants Responses:

"I was very badly abused as a child, and I've been told I had repressed the memories, but about 15 years ago they started to come through, so I've been working on them and getting support and that's really helped me lay them to rest".

"A mental imbalance, hereditary. It's a mental illness but if you've got the voices for 7 or 8 days then it becomes a physical illness too. Also upbringing and the earlier years' ignorance of mental health. Not being wanted by the family, and also the illness. It was OK having one person in the family to have it, but two was a disgrace, so I was kept in the quiet. Also I had seen my uncle in a mental hospital and that was really horrendous, so when I got it I thought 'I'm not telling anybody'. I didn't want to tell anybody in case I ended up in hospital, where my uncle was".

"Sometimes I blame my childhood, because I have nothing else to blame for it, I don't want to believe it's just my make-up. I just haven't managed to shake off the past and I keep striving to do it, hoping it will make things better, but it doesn't happen".

"I've no idea. I'm trying to figure it out. There's nothing traumatic, severe, that's happened in my life. I understand it is my interpretation of my negative side. A lot of negativity from my father and it could be an echo of what he said to me".

"I don't know. Genes probably. My dad had problems, so did my mother and my sisters. One's dead now. So it runs in the family pretty much."

"Having a breakdown I think. Stress. Stress brought the voices on. Stress and the breakdown."